

# **Extraction and Transformation of General Ledger Data from SAP ERP to Microsoft Power Pivot**

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<p>SAP ERP is an automated and integrated system that supports end-to-end business process of organization by combining functional and cross-functional business process, and integrating business modules into a logical architecture. SAP ERP has the ability to hold unstructured general ledger data from business transactions in data warehouse. Unstructured general ledger data brings no value to organizations, Microsoft Power Pivot is used to structure and transform the unstructured general data into structured data for analysis, reporting and decision making through fast, simple and efficient processes.</p> <p>The study was conducted through qualitative research that was divided into theoretical and empirical researches. The theoretical research is based on the literature analysis from books, courses provided by HAAGA-HELIA UAS, internet sources, community guidelines, journals and articles, and thesis. Meanwhile the empirical research is based on the business transaction scenario, extraction, transformation and loading of general ledger data, and an addition of brief explanation of Power View and Power BI.</p> <p>The dashboard created has shown the change in general ledger data as a result of the business transaction scenario, the dashboard clearly transforms the general ledger data into a structured report for analysis and decisions making. Additional findings regarding Power View and Power BI functionalities were discovered during the study. Power View has allowed the general ledger data to be presented in more stylish manners without eliminating the main idea of BI, while Power BI has shown its ability to allow users to share, collaborate, track and communicate one Power BI workbook through the SharePoint.</p>	
<p><b>Keywords</b> Business Intelligence, Microsoft Power Pivot, ETL, Dashboard, SAP ERP and General Ledger Accounting.</p>	

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## Glossary

BI	Business Intelligence
COA	Charts of Accounts
Credit	General Ledger Account Credit Amount
Dashboard	Performance Management Aggregated View
Data Warehouse	Central of Integrated Data
Data Marts	Subsets of Data Warehouse
DAX	Data Analysis Expressions
Debit	General Ledger Account Debit Amount
Dynamics NAV	Microsoft ERP System
ERP	Enterprise Resource Planning System
ETL	Extraction, Transformation and Loading
Financial Accounting	External and Internal Account Transactions
GBI	Global Bike Incorporated
GL	General Ledger
KPI	Key Performance Indicator
Master Data	Core of Organization Entities Data
ODS	Operational Data Source
OLAP	Online Analytical Processing
OLTP	Online Transaction Processing
Power BI	Microsoft Self Service BI Analysis
Power Pivot	Microsoft Data Analysis and Data Modelling
Power View	Microsoft Interactive Data Explorations, Visualizations, and Presentations
SAP	Systems, Applications and Products in Data Processing
SAP Business Objects	SAP Business Intelligence
SAP Table BKPF	SAP Table for Document Headers
SAP Table BSEG	SAP Table for Document Line Items
Scorecard	Progression Graphic of Entities Analysis
T-Account	General Ledger Account Visualization

Transaction Data

Executed Data from SAP ERP Transaction

# 1 Introduction

## 1.1 Background

The reasons behind this project started during my study in HAAGA-HELIA University of Applied Sciences where I got the chances to be acquainted with Enterprise Resources Planning related courses such as ERP Application and Business Process Development, SAP ERP Basics, SAP ERP Advanced, and Financial Management and Accounting Process. In spring 2013 I enrolled for a HAAGA-HELIA's intensive week course Business Intelligence, BUS8TF017-1 by Ralf Rehn where I got interested with the Business Intelligence and the use of it. After discussing with my thesis advisor, Ralf Rehn about the possible thesis subject I decided that I would do my thesis in the combination of SAP ERP and Microsoft Power Pivot whereas the thesis would be concentrated on the Extract, Transform and Load process. The idea did not come immediately as many changes were done and I encountered many obstacles along the way.

I choose SAP ERP for data extraction purpose because I believe that I have gotten enough knowledge and experience in using SAP ERP and since SAP ERP is available for students in HAAGA-HELIA UAS. The SAP ERP version used for this project is SAP ECC 6.0 with Global Bike as the company entity, client 204 and user GBI-183. For data transformation and loading purpose I choose Microsoft Power Pivot because it is easily accessible and available in HAAGA-HELIA's system, and also I believe that Microsoft Power Pivot is the simplest yet cost effective Business Intelligence system there is that transforms unstructured data into structured data using easily approachable image visualizations and presentations in Power Pivot workbook. General ledger data was chosen because it shows the external accounting process and business transactions of GBI organization through systematics and comprehensive collections of business transactions data.

Along the way of this project I have realized that using SAP ERP for data extraction purpose is not the easiest and getting the right data tables seems to me quite complicated, however as it has been decided before I would continue on working on this project with SAP ERP as the main data extraction source. After the summer holiday of

2014 I have gotten the chance to sit and talk with my thesis advisor where it was decided that it is better to emphasize and concentrate this thesis on the theory part and if there would be enough time it would be used for empirical part and project management.

It is hoped that this thesis would give me more understanding about the Extract, Transform and Loading of data from SAP ERP to Microsoft Power Pivot whereas the unstructured data would later be transformed into structured data using Microsoft Power Pivot Dashboard.

## **1.2 Research**

I choose qualitative research for this study because qualitative research delivers results that can be tested using case studies and unlike quantitative research there is no need of conducting mathematical modeling such as statistical modeling. (Strauss & Corbi 1998, 10-11.)

## **1.3 Research Questions**

The research question regarding this study derives from my observations through the previous studies conducted in HAAGA-HELIA UAS. Research question defines the focus of the study, guidance on how to conduct the study, and creating a communication between the writer and others about the goals of the research. (Maxwell 2005.)

In this study the main research question is, how can SAP ERP general ledger data be presented in Microsoft Power Pivot using ETL Process?

And from above mentioned research question derived two sub-questions:

- How to create the connection from SAP ERP to Microsoft Power Pivot? Is it a manual or an automated connection?
- What is the most suitable data presentation in Microsoft Power Pivot for GBI-183 General Ledger data?



## 1.4 Methodology

The methodology used in this study is a combination of theoretical and empirical research conducted during my study in HAAGA-HELIA UAS and during the actual thesis project.

The theoretical research is done through the literature analysis from books, SAP Help Portal, Microsoft Developer Network, journals and articles, thesis and courses provided in HAAGA-HELIA UAS. The information collected for the theoretical research is mainly focused on:

- Definitions, architectures and structures of Microsoft Power Pivot.
- ETL process.
- Data warehouse.
- Data presentation and visualization in Microsoft Power Pivot.
- Definitions, architectures and structures of SAP ERP.
- General ledger accounting.

The theoretical research serves as the basic fundamental of the empirical research and both theoretical and empirical research work together in order to answer the research questions. The empirical research serves as the answer to the research questions. The empirical research is conducted through observations, testing and try outs, and the actual extraction, transformation and loading process of general ledger data from SAP ERP to Microsoft Power Pivot.

## 1.5 Hypothesis

In order to conduct the study a hypothesis is needed in order to preliminary answers the research questions. The hypothesis also helps me to understand more about the study and focuses on the objectives.

The first hypothesis is that the SAP ERP general ledger data can be presented using pivot tables and pivot charts in Power Pivot workbook, the presented data in Power Pivot workbook can later be used in analysis, reporting and decision making.

The second hypothesis is that manual connection has to be created from SAP ERP to Microsoft Power Pivot because both SAP ERP and Microsoft Power Pivot in HAA-GA-HELIA UAS system are located in two separate database and there are access limitations to the SAP ERP database in Magdeburg, Germany.

The third and last hypothesis is that the most suitable data presentation in Power Pivot workbook is through Dashboards because they allow the users to modify and combine big amount of data with nice presentation, and enable the reports to be drilled down into specific information categories. (Microsoft SQL Server 2014.)

## **2 Business Intelligence**

Business Intelligence or BI is a tool for processing and transforming raw and unstructured data into knowledge, the knowledge is used for business purposes such as reporting, analytical thinking and decisions making. BI allows the organization to look and analyze the past and present situations, and predict the future trend of the organization and the market in order to make the right and effective decisions. BI strongly emphasizes on agile analytics to deliver the results by establishing methodologies and process that derive from the utilization of technology and data.

The goals of BI for each organization might be different from one to another, the primary goal of BI at the enterprise level is to deliver critical business information and analysis from all data sources in context and in a timely manner. (Biere 2010, 12.)

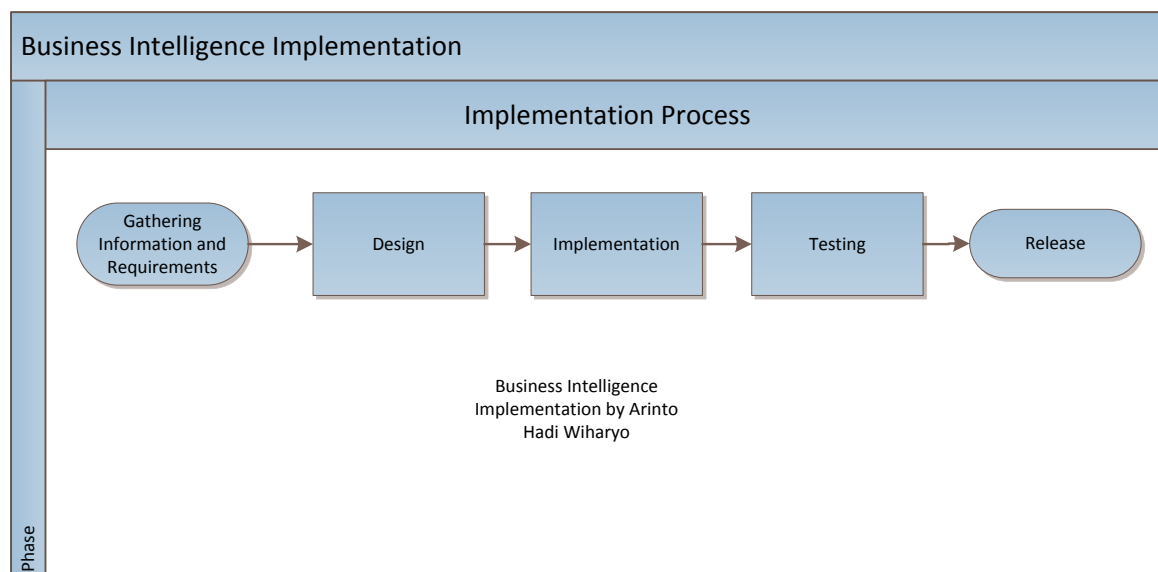
A true novelty of BI is its ability to present business information in a fast, simple and efficient way so that users can understand the logic and meaning of business information by employing a wide range of analytical possibilities and ad-hoc queries. (Hocevar & Jaklic 2010, 3.)

There are many types of BI available in the market and each BI brings its own advantages and disadvantages depending on the goals of the organization. Common examples of BI that are available in the market are Microsoft Power Pivot, QlikView, SAP Business Objects and IBM Cognos.

### **2.1 Business Intelligence Implementation**

The implementation of BI starts when an organization is in need of a fast, simple and efficient decision making tool for their executives. In order for the organization to start the BI implementation successfully both actors and the right metrics that align with the organization's goals, strategy and capabilities have to be defined. This step is often called as the gathering of the information and the requirements of the BI. This is the core of the BI implementation because BI implementation will not succeed without

knowing the agile organization's goals, strategy and capabilities that work hand-in-hand with the actors and the right metrics.



**Figure 1. Typical Business Intelligence Implementation**

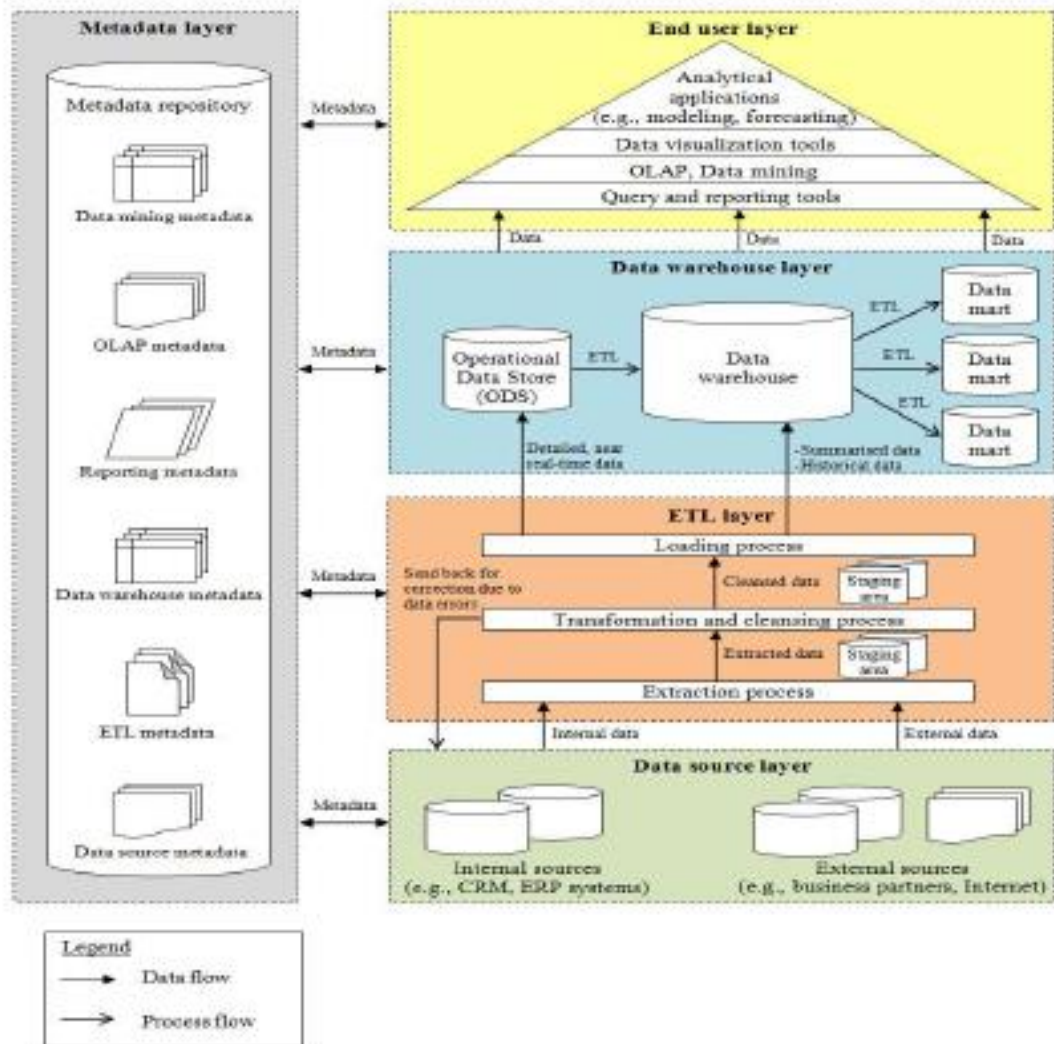
When the information and the requirements of the BI have been gathered, the design team starts designing the main functionalities that would be required by the organization from the utilization of the BI. The purpose of this design process is to define the right usability so that the BI would work accordingly with the organization goals, strategy and capabilities.

The implementation process is the realization and the creation of the technical specifications of the BI through computer programming and deployment. The implementation process of BI is done through careful supervision from the organization's executives and IT consultants. The implementation process also implements the data warehouse because data warehouse is the core of the BI that stores the data inside the system.

Finally when the implementation process is done, the BI is to be tested by the organization executives, design team, developer team and testers. When all entities feel confident and ready to release the BI, the BI is ready to be released to the organization's system; this process is called a release process.

## 2.2 Business Intelligence Architectures and Framework

Business Intelligence architecture is a framework for organizing the data, information management and technology components that are used to build BI systems for reporting and data analytics. (Rouse, 2010.) BI architecture might differ from one organization to another however the common BI architecture is as follows.



**Fig 1. Proposed BI Architecture**

Figure 2. BI Architectures (Ong, Siew & Wong 2011, 3.)

Typically BI Architecture consists of five layers, metadata layer, data source layer, ETL layer, data warehouse layer and end user layer. Each layer consists of its own modules that are working accordingly in order to deliver analysis, reporting and decision making capabilities.

### **2.2.1 Metadata Layer**

Metadata layer or data about data is the layer that defines and specifies the data structures which is saved in the data warehouse. Metadata layer arranges the logical data information, sources and structures of the data inside the data warehouse. Moreover metadata layer works as walls and filters for the data that is coming into the database. “The metadata layer is absolutely critical to the entire structures. It is not only where you define the sources, but where you may opt to add definitions, calculations, and more. This is often-discussed “single version of truth.”” (Biere 2010, 43.)

### **2.2.2 Data Source Layer**

Data Source Layer is the acquisition and collection of data into BI system, the use of the data can be acquired both internally and externally. Internal data source refers to data that is captured and maintained by operational systems inside an organization such as Customer Relationship Management and Enterprise Resource Planning systems. (Ong, Siew & Wong 2011, 4.) Data Source Layer often referred as OLTP or Online Transaction Processing is a place where the interaction between data is in real-time or online, and its main purpose is to get data into the BI system.

In BI system the use of external data source is the utilization of data outside the organization’s system. The data can be collected from many external sources, from vendors, customers, the internet, government organizations and business partners.

### **2.2.3 ETL Layer**

ETL layer consists of three main processes Extraction, Transformation and Loading. ETL or Extraction, Transformation and Loading is a process or act of putting the right information into the correct tablets of a database schema and manipulating certain fields to make them easier to work with. (O’Reilly Radar Team 2012, 4.)

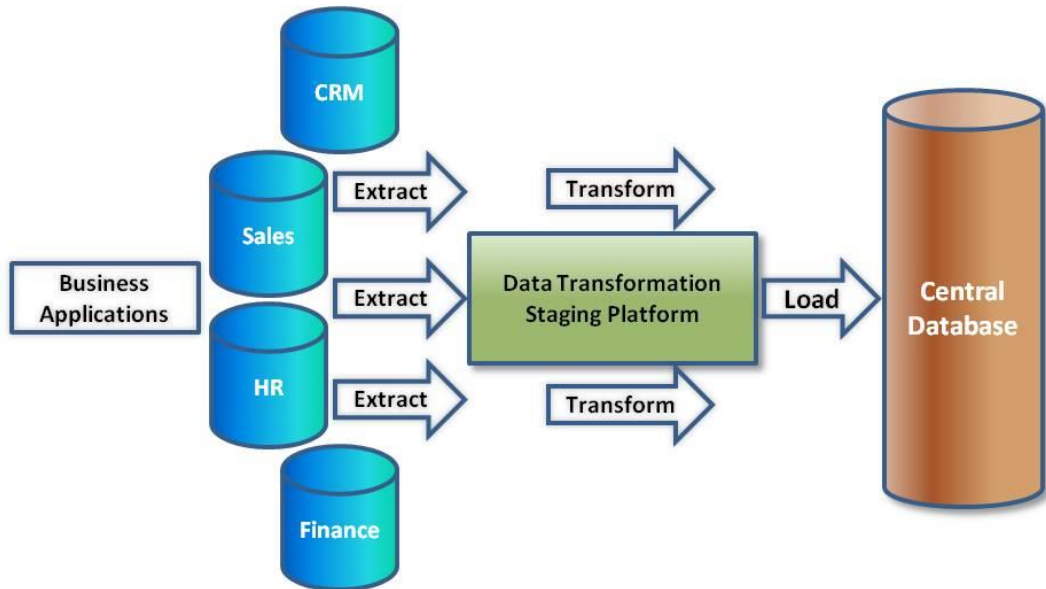


Figure 3. Extract Transform and Loading (IMC 2011.)

According to IMC, ETL Lifecycle can be concluded as a movement of data from source applications to final destination and consists of several steps.

- Validate data consistency from source to destination
- Integrate source data changes into monitoring processes
- Performance tuning, error repair, and processes scheduling
- Create transformation scripts for the new business requirements
- Maintain and monitor transformation scripts (IMC 2011.)

### Extraction

Extraction is the initial phase of ETL. The extraction process begins when the system is sending plain queries to the data source, either external or internal data source to extract the required data. In extraction process the data can be either structured or un-structured depending on the data source. Later on, the extracted data is placed in an area called a staging area where the transformation process takes place.

Extraction plays a major role of success for the ETL process. During extraction process data profiling and data quality control take place, they make sure that data inconsistency does not occur and when they occur they report the inconsistency to the system.

## **Transformation**

Transformation is the second phase of ETL, transformation is the phase when data staging takes place. During staging phase, extracted data is being staged and categorized depending on their attributes, this is done so that the data can be joined, filtered or to find the union.

The transformation process makes sure that the data is transformed into the right structure that the organization requires. During transformation process data quality is checked and it may include several process, cleansing, merging, sorting, defining unique identifiers, ensuring population timestamps, ensuring validity period date stamps, delta processing, creating data, validating data, ensuring validity period date stamps, delta processing, creating data, validating data, ensuring referential integrity, aggregating, summarizing and profiling data. (Laberge 2011, 257-258.)

## **Loading**

Loading is the final phase of ETL, the loading process is a process of combining, aggregating and loading the structured data into the desired data warehouse. There are three types of loading process in ETL, initial loading, refresh loading and update loading. The initial loading refers to the first time loading of data into data warehouse, refresh loading refers to dropping or deleting existing data and replacing them with the desired data, and update loading refers to the incremental load of new data to the data warehouse. (Laberge 2011, 281.)

The loading process allows the database to command real-time data integration so that OLAP can take place. Loading process is the phase when data analysis is possible and it allows any tools to emphasize on reporting and decision making purposes.

### **2.2.4 Data Warehouse Layer**

Data warehouse layer consists of three main components Operational Data Store or ODS, Data Warehouse and Data Marts. The first component is ODS, unlike other data warehouse layers ODS tends to focus on the operational requirements of a particular business process such as customer service. (Gartner 2013a.) ODS is used to inte-



grate unstructured data from multiple data sources into a single structured data to data warehouse. ODS works as a core that brings several functionalities to data warehouse layers such as merging of data, data manipulation and transformation, cleaning of data and validation of data.

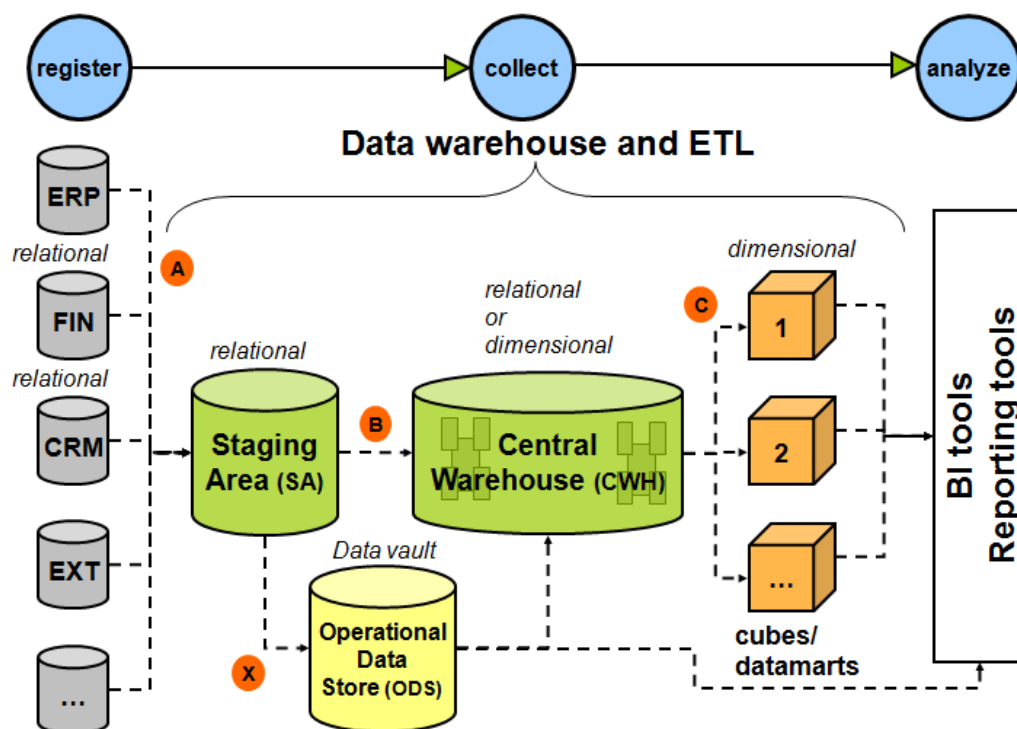


Figure 4. Data Warehousing (Passioned Group 2014.)

The second and the most important architecture in the data warehouse layer is the data warehouse itself. The data warehouse is a designated storage that holds records of structured data from ETL process, Operational Data Sources and other external sources. The main purpose of data warehouse is to provide and support decision making process through analysis and reporting in an instant, so that the decision can be made on time.

The third data warehouse layer are data marts. Data marts are the secondary part of data warehouse, the main purpose of data marts are to deliver similarly time-variant and subject-oriented data with relationships implying dimensional use of data that are distinctly separate from dimension data, making them more appropriate for single categories of analysis. (Gartner 2013b.) Data warehouse and data marts hold the key of data warehouse layer because they hold the optimized multi-dimensional and analytical queries that are ready to be sliced and diced for the end user layer.

### **2.2.5 End-User layer**

End user layer is illustrated as a pyramid that consists of several analysis tools for BI users. The pyramid consists of queries and reporting tools, OLAP and data mining, data visualization tools and analytical applications. The main purpose of the end-user layer is to provide the users with the ability to present the data in data warehouse through accumulated presentation within user applications such as BI.

## **2.3 Microsoft Power Pivot**

Microsoft Power Pivot is a Business Intelligence developed by Microsoft Corporation as an add-in to the Microsoft Excel 2010 and integrated in the later version of Microsoft Excel. According to Microsoft, Power Pivot is an add-in that can be used to perform powerful data analysis in Microsoft Excel, bringing a self-service BI to users' desktop. (Microsoft Office Support 2014a.)

The main thing that distinguishes Microsoft Power Pivot from other BI is that Microsoft Power Pivot allows the users to process a big amount of data within a short period of time in Pivot workbook, as Power Pivot is an add-in to Microsoft Excel many functionalities and buttons are derived from Microsoft Excel making it easier for common Microsoft Office users. One of the reasons why Microsoft Power Pivot was chosen for this project is because of its simplicity and the availability in HAAGA-HELIA UAS' system.

### **2.3.1 Microsoft Power Pivot Features**

Despite its simplicity Microsoft Power Pivot still brings a wide range of features with more agile and cost effective approach to the Business Intelligence, and not to mention delivering the main feature of Business Intelligence which is to present business information in a fast, simple and efficient way so that users can understand the logic and meaning of business information by employing a wide range of analytical possibilities and ad-hoc queries. (Hocevar & Jaklic 2010, 3.)

The main features of Microsoft Power Pivot are import million rows of data from multiple data sources, fast calculations and analysis within short period of time, virtually unlimited support of data sources that provides the foundation to import and combine many data sources into one, security and management through monitors and management from IT administrators, Data Analysis Expressions or DAX that enables the users to manipulate data in Excel through more sophisticated and complex grouping, calculation and analysis. (Microsoft Office Support 2014a.)

Importing millions of rows of data is done by collecting data from multiple data sources through ETL process, here the unstructured data from SAP ERP is imported into Microsoft Power Pivot. After the importing process Microsoft Power Pivot starts calculating and making analysis in Pivot workbook where the unstructured data is presented in the forms of dashboards or scorecards for analysis and decisions making purposes.

### **2.3.2 Reporting and Analysis in Microsoft Power Pivot**

In business, reporting should be straight forward and deliver the main objectives in a generally structured document that represents a specific set of data in a fairly structured manner. In advanced reporting the requirement system is called ad hoc reporting, ad hoc reporting focuses on a reduced number of specific users that are the real target of the reports. Ad hoc reporting allows reports to be done within a scalability concern that synchronizes with the set of data design.

As part of an add-in of Microsoft Excel, Power Pivot offers much similar functionality to Microsoft Excel. With create relationship between tables in Excel, Excel allows the users to combine many sets of data tables to create a single set of table that fulfills the ad hoc requirements. It is done through the process of creating a common primary key using unique and non-repeated values between set of tables. Besides creating relationship between tables Excel also offers the users the ability to create calculated columns in the designated table using DAX or Data Analysis Expressions.

### 2.3.3 Dashboard

Microsoft Power Pivot offers its users with a digital representation of the reports using Pivot table that utilizes set of data from data warehouse in dashboards and scorecards. Dashboard is an online application that represents an aggregated view of various aspects of performance management, assembled to provide the information necessary for the anticipated user base. (Janus & Misner 2011, 15.) Dashboards content can be from day-to-day basis, weekly and monthly to past and historical trend data. Dashboard is the presentation layer of the set of data that was arranged in the data warehouse.

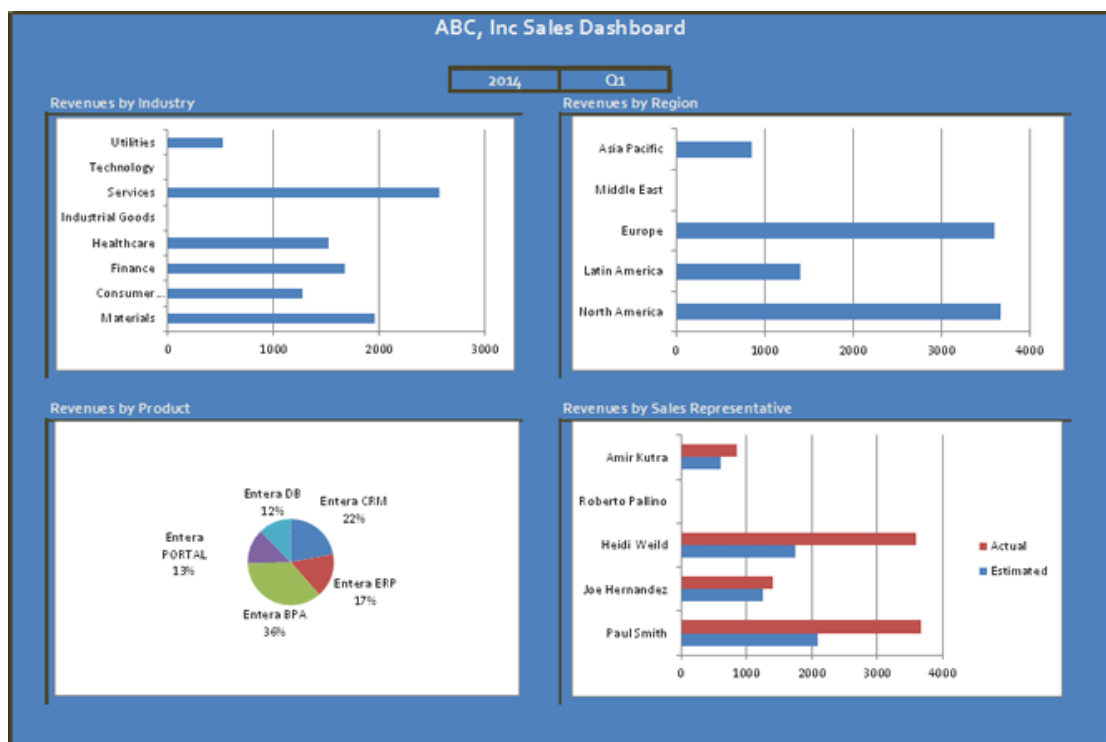


Figure 5. Sales Revenues Financial Dashboard (Microsoft Office Templates 2014.)

Figure 5 shows the sales revenue of ABC Inc. based on the industry, region, product and sales representative. In more depth dashboard presentation the data can be broken down into specific date, such as years, months and days.

### 3 SAP ERP

SAP ERP or Systems, Applications and Products in Data Processing is an ERP system that was developed by SAP AG which is headquartered in Walldorf, Baden-Württemberg, Germany. SAP ERP is an automated and integrated system that supports end-to-end business process of an organization by combining functional and cross-functional business process. SAP ERP enables an organization to integrate functional business modules into one logical system architecture that is working accordingly with data warehouse, SAP applications and non-SAP applications, administrator workbench, business explorer suite and data targets. Common SAP ERP modules are Supply Chain Management (SCM), Production Planning (PP), Sales and Distribution (SD), Materials Management (MM), Human Resources (HR) and Financial Accounting (FI) and Controlling (CO).

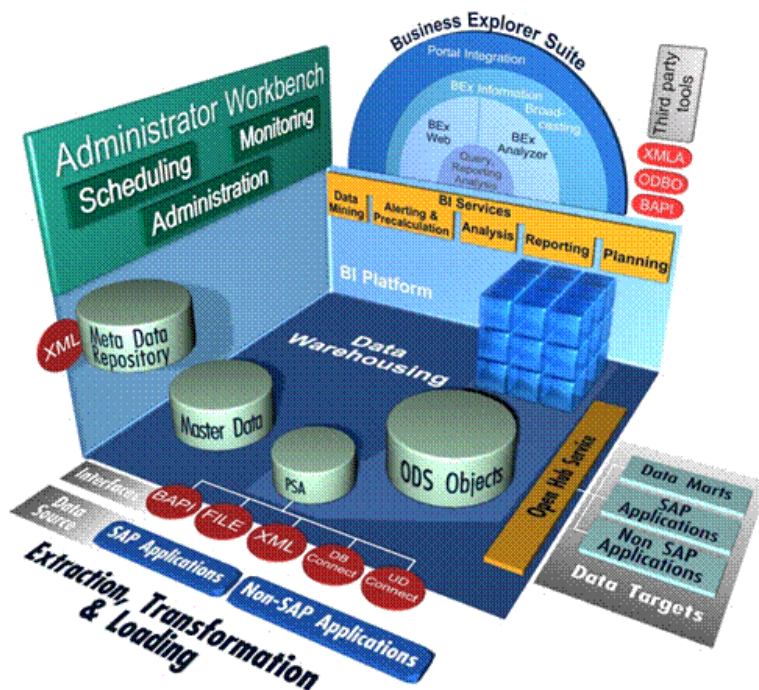


Figure 6. SAP ERP (SAP Help Portal 2014.)

All SAP ERP modules are working hand-in-hand through a real-time posting that allows the modules to store the data into the data warehouse. For example when a supply chain management process takes place, all information is stored into the data warehouse through the real-time posting process. The data warehouse stores all the busi-

ness transactions that are happening internally within the organization. By storing the business transactions in the data warehouse any other SAP ERP modules will have the capability to access the information whenever is needed.

### 3.1 HAAGA-HELIA UAS SAP ERP Ecosystem

HAAGA-HELIA UAS is a member of the SAP University Alliances or SAP UAC, SAP UAC supports HAAGA-HELIA UAS with SAP education projects through the practical and future-oriented education by enabling worldwide access to the newest SAP technology for both lecturers and students. (SAP UA EMEA Portal 2014.)

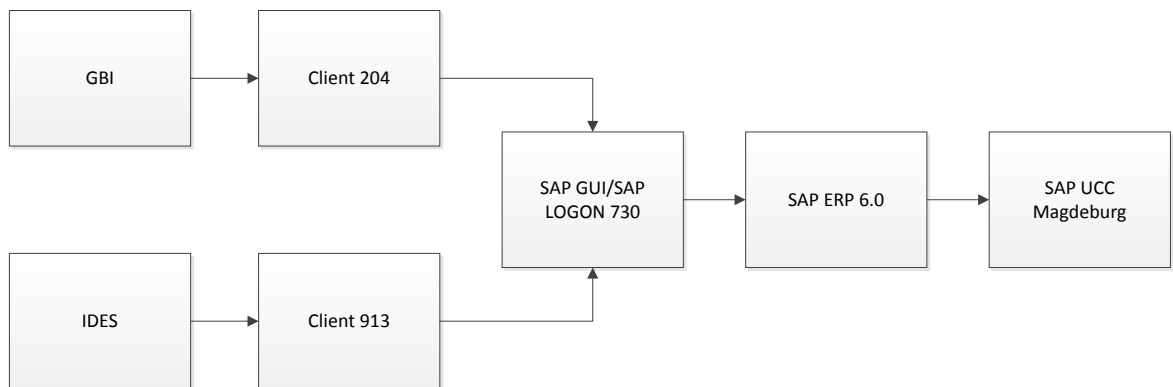


Figure 7. HAAGA-HELIA UAS SAP ERP Architecture

Currently HAAGA-HELIA UAS is running SAP ERP 6.0 that is hosted by SAP UAC in Magdeburg, Germany. The SAP ERP system in HAAGA-HELIA UAS consists of two learning models, Global Bike Incorporated or GBI, Internet Demonstration and Evaluation System or IDES. Each learning model consists of its own dataset for education purposes.

#### 3.1.1 Global Bike Incorporated

Global Bike Incorporated or GBI is a fictional company created for the sole purpose of illustrating real life examples and user experience of SAP ERP to the students and teachers. GBI was founded in 2001 after the merger of two bicycle manufacturers in the United States (US00) and Germany (DE00) and it has three business areas, deluxe and professional touring bikes, men's and women's off-road bikes, and bike accessories. (Magal & Word 2012, 15.)

GBI enterprise's structure is as follows



Figure 8. GBI Enterprise Structure (Magal & Word 2012, 16.)

GBI Global is the GBI organization highest hierarchy that is exclusively given to the GBI enterprise and defines only one single enterprise, GBI Global has two company codes GBI US (US00) and GBI Germany (DE00). Each Company code has its own manufacturing plant and distribution center. GBI US with its Miami distribution center, San Diego distribution center and Dallas Manufacturing plant, and GBI Germany with Heidelberg manufacturing plant and Hamburg distribution center.

### 3.2 SAP ERP Master Data and Transaction Data

SAP ERP master data is the core that represents entities within all business processes of an organization. Master data represents business entities such as customers, vendors and materials and the processes that are involved in them such as selling of goods to customers and acquisitions of materials from vendors. SAP ERP master data is a collection of master record(s). One or many master record(s) can make up master data of the specific business entity, for example a vendor has vendor master record and all vendor master record(s) in SAP ERP system make up one vendor master data.

Unlike master data, transaction data represents executed processes or transactions that involve master data. Transaction data are commonly used in day-to-day process in the form of transaction documents. A transaction document might represent many master data but it can only represent one single transaction data. For example in the process

of order purchasing, material master data, customer master data and vendor master data are used in order to fulfill the order purchasing process. The three master data are used in order to make sure that the order purchasing process happens according to the business requirements.

### **3.3 Financial Accounting**

Accounting is the process of identifying, recording, summarizing, and reporting economic information for decision makers that is primarily caused by business transactions. Accounting is mainly divided into two main categories, financial accounting and management accounting. Financial accounting's main task is to record all the transactions that happen within an organizations, both externally and internally. The main purpose of financial accounting is to meet the legal financial reporting requirements in order to report them to SEC or Securities and Exchange Commission, and IRS or Internal Revenue Service in the United States.

Financial accounting plays an important role within an organization as it is the core of an organization and it reflects how healthy the organization is at the current given time. Financial accounting can be broken down into several accounting process such as general ledger accounting, accounts receivable accounting, accounts payable accounting, asset accounting and bank ledger accounting. (Magal & Word 2012, 50.)

#### **3.3.1 Accounting Documents**

In financial accounting, financial accounting document or FI document records the impact of a transaction process on financial accounting. (Magal & Word 2012, 58.) It forms the basic structure for providing the right information about the financial accounting process.



C	Comp	Bus.	Texts	Reporting period	Comparison period	Absolute	Re1	Sumtn
F	code	area		(01.2014-16.2014)	(01.2013-16.2013)	difference	dif	level
	US00		100000 Bank Account	1,529,734.62	1,277,231.00	252,503.62	19.8	
	US00		100356 Bank Account356	1,500.00-	0.00	1,500.00-		
	US00		100635 Bank Account 363	1,500.00-	0.00	1,500.00-		
	US00		101000 Alternate Bank Account	336,595.00	401,525.00	64,930.00-	16.2-	
	US00		110000 Trade Accounts receivables	121,312.50	56,215.00	65,097.50	115.8	
	US00		110100 Miscellaneous Accounts Receivable	89,800.00	0.00	89,800.00		
	US00		200000 Inventory-Raw Materials	1,063,961.50	1,118,720.50	54,759.00-	4.9-	
	US00		200100 Inventory-Finished Goods	579,600.00	247,000.00	323,600.00	131.0	
	US00		200200 Inventory-Trading Goods	631,250.00	908,000.00	276,750.00-	30.5-	
	US00		200300 Inventory-Semi-finished Goods	131,340.00	134,200.00	2,860.00-	2.1-	
	US00		200400 Inventory-Production Supplies	5,600.00	0.00	5,600.00		
	US00		200500 Inventory-Suspense (Heaven)	1,886,400.00-	1,945,350.00-	58,950.00	3.0	
	US00		200600 Inventory-Operating Supplies	11,421.00	0.00	11,421.00		
	US00		300000 Payables-Trade Accounts	47,817.00-	34,050.00-	13,767.00-	40.4-	
	US00		300200 Payables-Miscellaneous	1,383.20-	0.00	1,383.20-		
	US00		300303 Bank Loan Payable	27,000.00-	0.00	27,000.00-		
	US00		300326 G/L Acct Long Text: Bank Loan Payable	35,000.00-	0.00	35,000.00-		
	US00		300329 Bank loan Payable	14,300.00-	0.00	14,300.00-		
	US00		300350 Bank Loan Payable	12,000.00-	0.00	12,000.00-		
	US00		300351 Bank Loan Payable	30,000.00-	0.00	30,000.00-		
	US00		300353 Bank Loan Payable	12,200.00-	0.00	12,200.00-		
	US00		300354 Bank loan payable	32,300.00-	0.00	32,300.00-		
	US00		300356 Bank loan payable	30,000.00-	0.00	30,000.00-		
	US00		300357 Bank Loan Payable	15,000.00-	0.00	15,000.00-		
	US00		300358 Bank Loan Payable	10,000.00-	0.00	10,000.00-		
	US00		300400 Payables-Short-Term Notes	15,000.00-	0.00	15,000.00-		
	US00		300500 Payables-Long-Term Notes	1,000.00-	0.00	1,000.00-		
	US00		310000 Goods Receipt / Invoice Receipt Account	218,750.00-	227,450.00-	8,700.00	3.8	
	US00		329000 Common Stock	0.00	60,000.00-	60,000.00	100.0	
	US00		600000 Sales Revenue	2,297,221.00-	2,426,400.00-	129,179.00-	5.3	
	US00		610000 Sales Discount	30,109.88	59,777.50	29,667.62-	49.6-	
	US00		720000 Raw Material Consumption Expense	473,938.50	493,629.50	19,691.00-	4.0-	
	US00		720300 Semi-Finished Consumption Expense	220,660.00	228,800.00	8,140.00-	3.6-	
	US00		740000 Supplies Expense	25,118.20	15,151.50	9,966.70	65.8	
	US00		740100 Utilities Expense	1,330.00	0.00	1,330.00		
	US00		740200 Legal and Professional Expense	800.00	0.00	800.00		
	US00		740500 Payroll Expense-Office	29,400.00	0.00	29,400.00		
	US00		740700 Sales Expense	29,600.00-	0.00	29,600.00-		
				555,000.00	247,000.00	308,000.00	124.7	*1*

Figure 9. GBI-183 Financial Statements

The above figure was created using transaction S\_ALR\_87012284 or from SAP menu Accounting -> Financial Accounting -> GL -> Information System -> GL Reports (New) -> Financial Statement/Cash Flow -> General -> Actual/Actual Comparisons -> Financial Statement

- Chart of accounts: GL00
- G/L account 60000 to 740700
- Company Code US00
- Financial statement version: BAFI
- Language: EN
- Reporting year: 2014 Reporting periods: 1 to 16
- Comparison year: 2013
- Comparison periods: 1 to 16

Typically an FI document consists of two sections, headers and items. The headers define the information that is applied to the document and the items define the amount of debit or credit item. The header section typically consists of document data, document type, document number, company code, posting date, currency and reference number while the items section consists of account, description, debit or credit posting key and amount.

Both headers and items have to give enough information and description of the transaction process, the actors that are involved in the transaction process usually in the form of company code, the amount of debit or credit and a unique assignment of the documents numbers in the form of posting keys.

### **3.3.2 General Ledger Accounting**

General ledger accounting concentrates on all the external accounting process that happen within an organization, it records all the business transactions both systematically and comprehensively. General ledger accounting's main task is to provide a comprehensive picture of the external accounting process and the accounts involved in it. (Brinkmann & Zeilinger 2010, 79.) In SAP ERP, general ledger accounts are summarized into charts of accounts or COA. Charts of account are collections of general ledger accounts in one directory.

General ledger accounting typically consists of liabilities, assets, revenues, expenses and equities. Liabilities are the amount that an organization owes to others. Assets are what an organization actually owns such as cash, inventory and capitals. Revenues are the amount of money that an organization earns by selling or providing products and services to others. Expenses are the amount of the costs required in order to produce, sell and provide the products and services to others. Equities are the amount that shareholders and/or owners own that is part of the organization.

General ledger accounting provides the following functionalities

- Automatic and simultaneous posting of all sub-ledger items to the corresponding ledger accounts (reconciliation accounts, i.e. accounts receivable, accounts payable, asset.)
- Simultaneous updating of the general ledger and controlling data (i.e. cost centers, internal orders, etc.)
- Real time evaluation and reporting of current posting data in the form of account displays and closing accounts with different financial statement versions, as well as additional analyses. (Brinkmann & Zeilinger, 2010 79.)

A common representation of a general ledger accounting is through the T account that indicates the debit and credit items. Debit and credits are the amount that record the changes made to the general ledger account resulting from business transactions. The amount of debit and credit in the general ledger accounting have to be in balance for each business transaction.

**Table 1. Debits and Credits (Magal & Word 2012, 61.)**

<b>Account name</b>	
<b>Debit</b>	<b>Credit</b>
<b>Assets and expenses +</b>	Assets and expenses -
<b>Revenue and liabilities -</b>	Revenue and liabilities +

Account name indicates the type of account used for the business transaction such as cash investment, bank interest revenues and inventory replenishment. In T account debits are displayed on the left side while credits are displayed on the right side, an increase in the assets and expenses resulted in an increase in the debit while a decrease in the assets and expenses resulted in an increase in the credit. For revenue and liabilities, a decrease in revenue and liabilities resulted in a decrease in the debit while an increase in the revenue and liabilities resulted in an increase in the credit.

## **4 Empirical Background**

### **4.1 Purpose**

The purpose of this project is to analyze the general ledger data in HAAGA-HELIA UAS' SAP ERP system through business transactions scenario, extraction, transformation and loading using Microsoft Power Pivot. As an addition to this, GBI general ledger data would be presented in Power View and is going to be uploaded to HAAGA-HELIA's SharePoint using Power BI.

### **4.2 Business Scenario**

Despite a lack of a commissioning party, a business scenario that would give a better understanding of the study would be created for this thesis. The scenario is as followed, Global Bike Incorporated of GBI is in need of a simple yet cost effective tool for analyzing their external accounting process that happens within the organization. All business transactions are recorded in their SAP ERP system and displayed in the form of general ledgers in directories called chart of accounts.

GBI is utilizing their SAP ERP system to post transfer some funds through "T" accounting that consists of debit and credit accounts. The debit and credit accounts are part of GBI general ledger accounts that record all the business transactions within the GBI organization. After the post transfer is done, the transferred funds are used for the purpose of paying bike transport.

After all the business transactions are done, GBI is in need to analyze the business transaction through a simple yet cost effective analysis tool therefore Microsoft Power Pivot was chosen. However it was realized that there is an access limitation from GBI's SAP ERP system to Microsoft Power Pivot, therefore a manual extraction has to be done in order to analyze the general ledger data. The manual extraction is done through data browser in SAP ERP system and by downloading them to spreadsheet documents.

### 4.3 Prerequisites

In order to conduct the scenario several prerequisites have to be available

- Access to HAAGA-HELIA UAS' system or through Citrix Receiver.
- SAP LOGON 730 provided by SAP UAC Magdeburg, Germany with GBI credentials GBI-183.
- Microsoft Excel 2013.
- Microsoft Power Pivot, Power View and Power BI.

All systems are located in HAAGA-HELIA UAS' architecture therefore HAAGA-HELIA UAS's system works as the fundamental system of this study. SAP Logon used for this study is SAP Logon 730 provided by SAP UAC Magdeburg, Germany and SAP credentials GBI-183 was given by HAAGA-HELIA UAS' SAP courses teacher Jarmo Harmonen. Microsoft Excel 2013 is part of Microsoft Office 365 that is available for all units in HAAGA-HELIA UAS. Microsoft Power Pivot and Power View are included in Microsoft Excel 2013, while Power BI is part of HAAGA-HELIA UAS' SharePoint system.

### 4.4 Process

The empirical study consists of four main processes

- Display and transfer of GBI general ledger data.
- The extraction of general ledger data from SAP ERP.
- The transformation of general ledger data using Microsoft Excel and Power Pivot.
- The uploading of the Power Pivot to Power BI.

Each process consists of different steps based on the business transaction scenario mentioned before. Each process is done through agile and specific methods so that the study would be as accurate as possible.

## 5 Empirical Process

### 5.1 Display and Transfer of GBI General Ledger Data

The foundation of the display and transfer of GBI general ledger data is the exercise FI 1 to FI 9, provided by SAP University Alliances through Financial Management and Accounting course. (SAP University Alliances.) The exercise consists of nine different exercises, display chart of accounts, display chart of accounts 2, display general ledger account, post transfer of funds to alternate bank account, display general account document, post purchase of office supplies, display general ledger account balances, change financial accounting document and display changes to financial accounting documents. However for the purpose of this study some changes were done in order to create a better business transaction scenario that clearly pictures the change in the general ledger accounts.

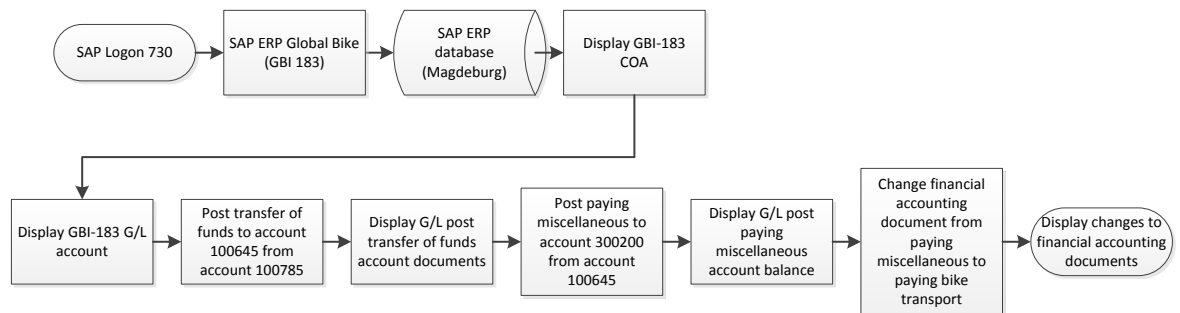


Figure 10. Display and Transfer of GBI-183 General Ledger Data

The whole process starts through a SAP ERP login process with SAP Logon 730 using GBI-183 credential, as it was mentioned before the SAP ERP in HAAGA-HELIA UAS' system is provided by SAP UAC Magdeburg, Germany. The first actual SAP ERP transactions are display GBI-183 chart of accounts and general ledger accounts.

#### Display Chart of Accounts

- Transaction S\_ALR\_87012326 or Accounting -> Financial Accounting -> General Ledger -> Information System -> General Ledger Reports (New) -> Master Data -> Chart of Accounts
- COA: GL00 (GBI Global)
- Charts of accounts not assigned: 1

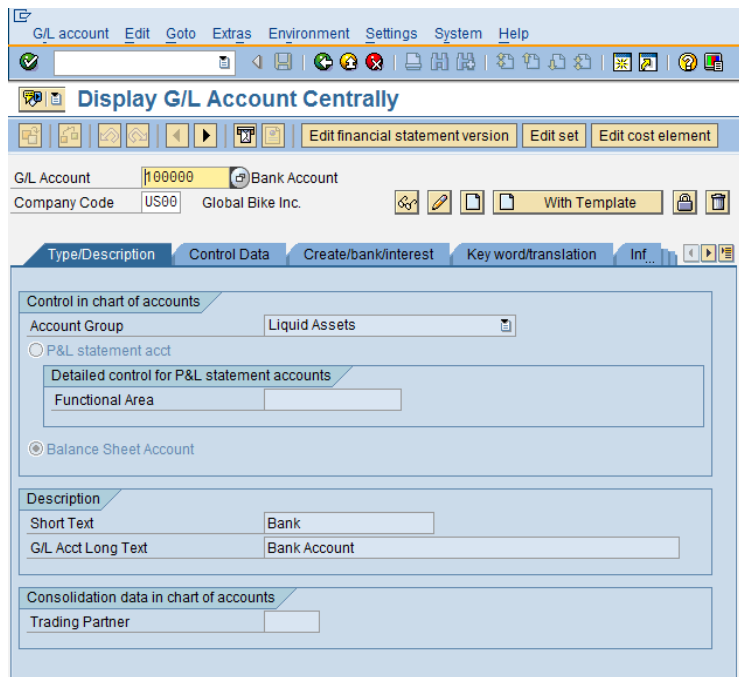
G/L acct	G/L Acct Long Text
100000	Bank Account
100350	Bank Account
100351	Bank Account 351
100354	Bank Account354
100356	Bank Account356
100357	Bank Account 357
100358	Bank Account 358
100359	Bank Account 359
100360	Bank Account 360
100362	Bank Account 362
100364	Bank Account364
100367	Bank Account 367
100374	Bank Account 374
100376	Bank Account376
100380	Bank Account 380
100381	Bank Account 381
100635	Bank Account 363
100645	Bank Account 064
100785	Bank Account 078
101000	Alternate Bank Account
101326	Cash Account
101605	Bank Account 366
101665	Bank Account 366
110000	Trade Accounts receivables
110100	Miscellaneous Accounts Receivable
110200	Interest Receivable
110360	Payables-Miscellaneous 360
110364	Payables-Miscellaneous364
110367	Payables-Miscellaneous367
110374	Payables-Miscellaneous 374
110376	Payables-Miscellaneous376
110380	Payables-Miscellaneous 380
110645	Payables-Miscellaneous 064
110785	Payables-Miscellaneous 078
113505	Payables-Trade Accounts
113515	Payables-Miscellaneous 351
113545	Payables-Miscellaneous354
113565	Payables-Miscellaneous356
113575	Payables-Miscellaneous 357
113585	Payables-Miscellaneous 358
113595	Payables-Miscellaneous 359
113625	Payables-Miscellaneous 362
113635	Payables-Miscellaneous 363

Figure 11. Display Chart of Accounts

Figure 12 shows the chart of accounts for GBI Global (GL00), it shows different chart of accounts from Bank Account to Payable-Miscellaneous as 12.11.2014.

### Display General Ledger Account

- Transaction FS00 or Accounting ->Financial Accounting -> General Ledger -> Master Records -> G/L Accounts -> Individual Processing -> Centrally
- G/L Account: 10000, Bank Account, Liquid Assets



**Figure 12. Display General Ledger Account**

The purpose of displaying the general ledger and chart of accounts is to show how accounting process is recorded in SAP ERP system, Figure 11 and Figure 12 both show the general ledger and chart of accounts in a short description manner that users would understand and to help build an understanding of which accounts would be used in the following transactions.

The second SAP ERP business transactions are post transfer of funds to account 100645 from account 100785 and display general ledger post transfer of funds documents.

### **Post Transfer of Funds to Account 100645 from Account 100785**

- Transaction FB50 or Accounting -> Accounting -> Financial Accounting -> General Ledger -> Posting -> Enter G/L Account Document
- Company Code: US00, Global Bike Inc. Dallas
- Doc Header Text: Transfer of Funds
- Reference: 183
- Doc Date: 11/06/2014 (US Format)
- Currency: USD
- Accounts: 100645 Bank 064 (Debit) and 100785 Bank 978 (Credit)



- Amount: \$5000,00 and \$5000,00
- Document -> Simulate G/L -> Post -> Document Number: 100000742

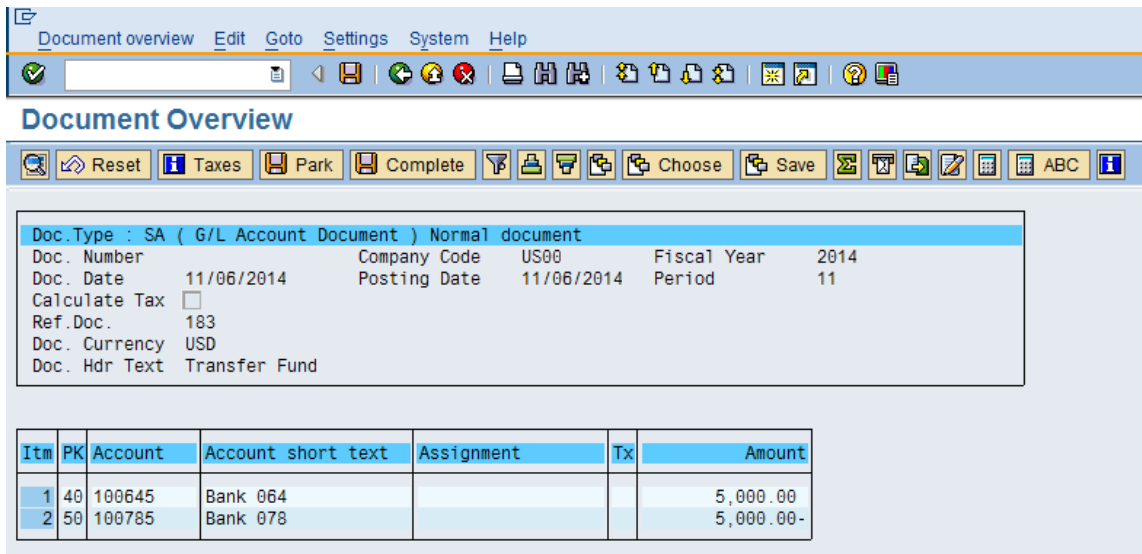


Figure 13. Post Transfer of Funds to Account 100645 from Account 100785

### Display General Ledger Documents Post Transfer of Funds

- Transaction FB03 or Accounting -> Financial Accounting -> General Ledger -> Document -> Display
- Company Code: US00
- Reference: 183

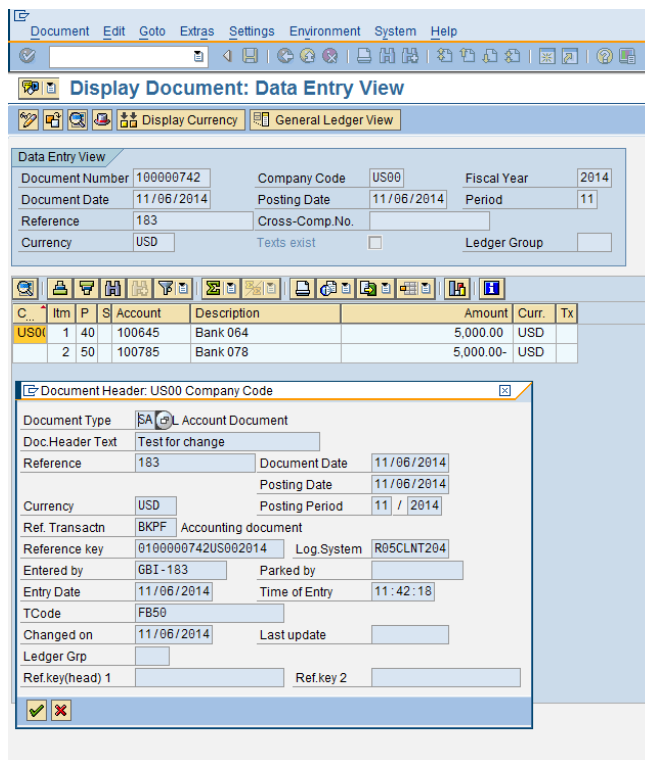


Figure 14. Display General Ledger Post Transfer of Funds Documents

Figure 13 and Figure 14 show the post transfer of funds process from account 100785 to account 100645. Account 100645 has received the amount of \$ 5.000,00 through debit while account 100785 has a reduction of \$ 5.000,00 through credit. This is the foundation of general ledger accounting as it was explained before. General ledger accounting records all business transactions that happen within an organization, typically general ledger accounting consists of two or more accounts. For each debit transaction there should be a credit transaction or vice versa, and the amount should be balance on both sides.

The third SAP ERP business transactions are post paying miscellaneous to account 300200 from account 100645 and display G/L post paying miscellaneous account balances.

#### **Post Paying Miscellaneous to Account 300200 from Account 100645**

- Transaction FB50 or Accounting -> Financial Accounting -> General Ledger -> Posting -> Enter G/L Account Document
- Document Date: 11/06/2014 (US Format)
- Reference: 183
- Doc. Header Text: Paying Misc
- Accounts: 300200 Payable Miscellaneous (Debit) and 100645 Bank 064 (Credit)
- Amounts: \$80,00 and \$80,00
- Document Number: 100000747

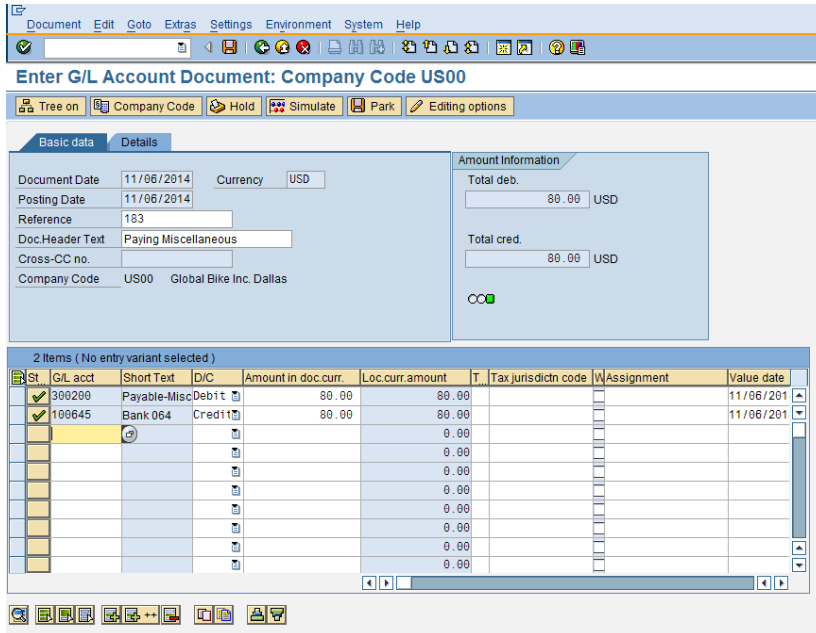


Figure 15. Post Paying Miscellaneous to Account 300200 from Account 100645

### Display G/L Post Paying Miscellaneous Account Balances

- Transaction FAGLB03 or Accounting -> Financial Accounting -> General Ledger -> Account -> Display Balances (New)
- Account Number: 100645 Bank 064
- Company Code: US00
- Ledger: OL

Account Number: 100645 Bank 064, Company Code: US00 Global Bike Inc., Fiscal Year: 2014, Display Currency: USD.

Period	Debit	Credit	Balance	Cum. balance
Bal. Carryforw				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11	5,000.00	80.00	4,920.00	4,920.00
12				4,920.00
13				4,920.00
Total	5,000.00	80.00	4,920.00	4,920.00

Figure 16. Display G/L Post Paying Miscellaneous Account Balances

Figure 15 and Figure 16 show the post paying miscellaneous transaction through general ledger accounting that consist of debit and credit accounts. Account 300200 works as the debit account while account 100645 works as the credit account and there is a balance amount on each account, account 300200 has received the amount of \$80,00 while account 100645 has a reduction of \$80,00. To proof that the business transaction has taken place, Figure 18 shows that the balance amount on account 300200 has been reduced from \$5.000,00 to \$4.200,00 through a credit transaction of \$80,00.

The last SAP ERP business transactions are change financial accounting document from paying miscellaneous to paying bike transport and display changes to financial accounting documents.

### Change Financial Accounting Documents from Paying Miscellaneous to Paying Bike Transport

- Transaction FB02 or Accounting -> Financial Accounting -> General Ledger -> Document -> Change
- Document Number: 100000747
- Company Code: US00
- Fiscal year: 2014

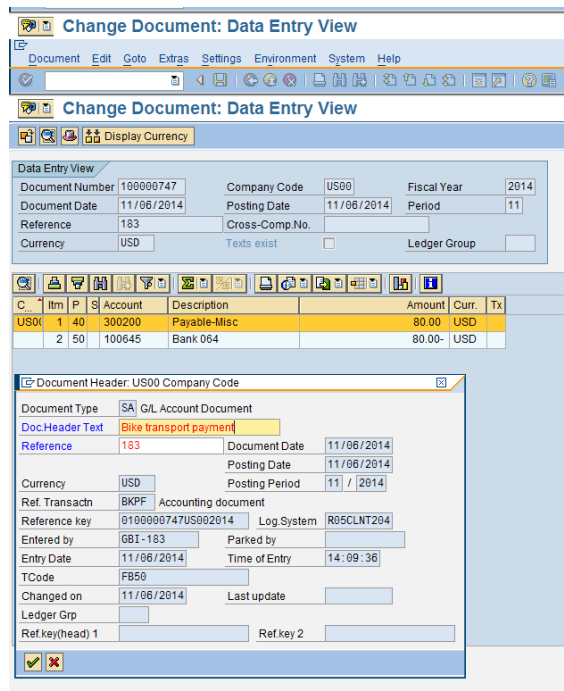


Figure 17. Change Financial Accounting Document from Paying Miscellaneous to Paying Bike Transport

## Display Changes to Financial Accounting Documents

- Transaction FB04 or Accounting -> Financial Accounting -> General Ledger -> Document -> Display Changes
- Company Code: US00
- Document Number: 100000747
- Fiscal Year: 2014

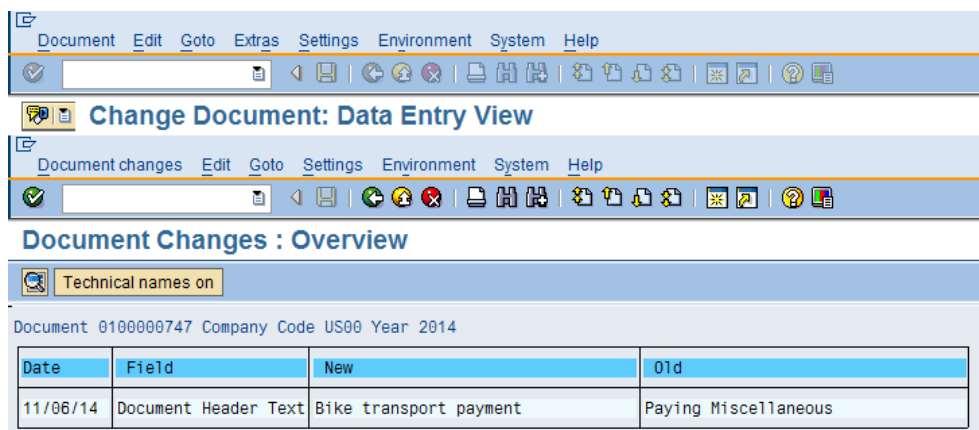


Figure 18. Display Changes to Financial Accounting Document

Figure 17 and Figure 18 were intended to show the SAP ERP capability of manipulating the headers in general ledger documents. The change in the field document header text would be used for analysis and reporting purpose in the following process, transformation of general ledger data using Microsoft Power Pivot.

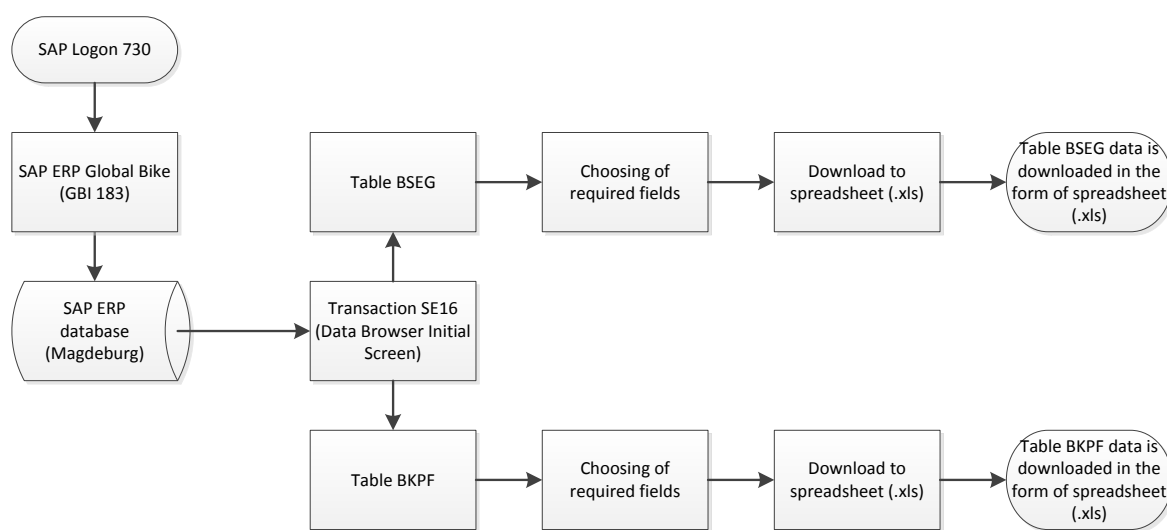
Display changes to financial accounting document marks the end of the first business transactions scenario that was intended to illustrate the business transactions processes in general ledger, the figures clearly shows that SAP ERP system's general ledgers record all the business transactions systematically and comprehensively. The next process in this study is the extraction of general ledger data from SAP ERP.

## 5.2 Extraction of General Ledger Data from SAP ERP

The extraction of general ledger data is the second process of this study. The reason behind the extraction of general ledger from SAP ERP is because there is an access restriction to SAP ERP database, and it would require so much time and process in

order to gain the access permission from SAP UAC Magdeburg Germany. After some studies it was concluded that the required tables are table BKPF and table BSEG.

Table BKPF represents the document header that includes general ledger, customer and vendor items; meanwhile table BSEG represents the document line item that includes general ledger, customer and vendor items. (Narang 2007.) Both tables are listed under the FI module in SAP ERP therefore they are connected to and from all other modules in SAP ERP. All transactions posted to SAP ERP FI module would be stored in table BKPF and table BSEG.



**Figure 19. Extraction of General Ledger Data from SAP ERP**

The extraction process begins with the SAP login to SAP logon 730 with GBI-183 credential. As it has been mentioned before, the SAP ERP system in HAAGA-HELIA UAS is provided by SAP UAC Magdeburg therefore the entire database are stored in their ecosystem in Magdeburg, Germany. The extraction process mainly consists of data browser of table BSEG and table BKPG which are followed by choosing of required fields and downloading the tables to spreadsheets.

### **Table BKPF Data Browser**

- Transaction SE16 or Tools -> ABAP Workbench -> Overview -> Application Hierarchy -> Data Browser.
- Table Name: BKPF



Figure 21 shows that the chosen fields are MANDT, BUKRS, BELNR, GJHAR, BLART, BLDAT, MONAT, AEDAT, USNAM, TCODE, XBLNR and WAERS. For more explanations regarding these tables please check Appendix 1. BKPF field labels. The actual extraction process happens with one single right click on the fields -> Download -> Spreadsheet -> Desired destination.

### Table BSEG Data Browser

- Transaction SE16 or Tools -> ABAP Workbench -> Overview -> Application Hierarchy -> Data Browser.
- Table Name: BSEG
- BUKRS: US00, Global Bike Inc.
- GJAHR: 2014
- KOART: S, G/L Accounts
- Width of Output List: 250
- Maximum No. Of Hits: 100000

MANDT	BUKRS	BELNR	GLNR	BUZEI	BUZID	AUGST	AUGCP	AUGSL	BSCH	KOART	ENKZ	ZFHS	SHZG	OSBR	PARG	ENKZ	USKZ	USPTR	USBTR	KZBTR	F0M1	F0M2	TXB1	TXB2
204	US00	009000300	2014	001	01/27/2014	01/27/2014	140000277	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000300	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000301	2014	001	01/28/2014	01/28/2014	140000275	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000301	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000302	2014	001	01/28/2014	01/28/2014	140000274	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000302	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000303	2014	001	01/28/2014	01/28/2014	140000276	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000303	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000304	2014	001	01/28/2014	01/28/2014	140000277	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000304	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000305	2014	001	01/28/2014	01/28/2014	140000278	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000305	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000306	2014	001	01/28/2014	01/28/2014	140000279	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000306	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000307	2014	001	01/28/2014	01/28/2014	140000280	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000307	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000308	2014	001	01/28/2014	01/28/2014	140000281	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000308	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000309	2014	001	01/28/2014	01/28/2014	140000282	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000309	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000310	2014	001	01/28/2014	01/28/2014	140000283	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000310	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000311	2014	001	01/28/2014	01/28/2014	140000283	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000311	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000312	2014	001	01/28/2014	01/28/2014	140000284	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000312	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000313	2014	001	01/28/2014	01/28/2014	140000285	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000313	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000314	2014	001	01/28/2014	01/28/2014	140000285	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000314	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000315	2014	001	01/28/2014	01/28/2014	140000286	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000315	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000316	2014	001	01/28/2014	01/28/2014	140000286	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000316	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000317	2014	001	02/11/2014	02/11/2014	140000288	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000317	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000318	2014	001	02/11/2014	02/11/2014	140000287	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000318	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000319	2014	001	02/11/2014	02/11/2014	140000289	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000319	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000320	2014	001	02/11/2014	02/11/2014	140000291	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000320	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000321	2014	001	02/11/2014	02/11/2014	140000292	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000321	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000322	2014	001	02/11/2014	02/11/2014	140000293	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000322	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000323	2014	001	02/11/2014	02/11/2014	140000294	01	D	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD	0.00	0.00
204	US00	009000323	2014	002	00/00/0000	00/00/0000		50	S	S	H	BI00						15,000.00	15,000.00	0.00	15,000.00	USD		



Table: BSEG  
Displayed Fields: 11 of 11 Fixed Columns: 4 List Width: 0250

MANDT	BUKRS	BELNR	GJAHR	GSBER	PSWBT	PSWSL	VALUT	KOKRS	KOSTL	HKONT
204	US00	5000000737	2014		49,000.00	USD	09/30/2014	NA00		0000741700
204	US00	5000000738	2014		2,000.00	USD	09/30/2014	NA00		0000310000
204	US00	5000000739	2014		2,000.00	USD	10/01/2014	NA00		0000310000
204	US00	5000000739	2014		2,000.00	USD	10/01/2014	NA00		0000310000
204	US00	5000000740	2014		44,800.00	USD	10/01/2014	NA00		0000741700
204	US00	5000000741	2014		2,000.00	USD	10/02/2014	NA00		0000310000
204	US00	5000000741	2014		2,000.00	USD	10/02/2014	NA00		0000310000
204	US00	5000000742	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000743	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000744	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000745	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000746	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000747	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000748	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000749	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000750	2014		3,200.00	USD	10/03/2014	NA00		0000310000
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204	US00	5000000752	2014		3,200.00	USD	10/03/2014	NA00		0000310000
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204	US00	5000000756	2014		3,200.00	USD	10/03/2014	NA00		0000310000
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204	US00	5000000758	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000759	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000760	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000761	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000762	2014		6,400.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000763	2014		3,200.00	USD	10/03/2014	NA00		0000310000
204	US00	5000000764	2014		2,000.00	USD	10/06/2014	NA00		0000310000
204	US00	5000000764	2014		2,000.00	USD	10/06/2014	NA00		0000310000
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204	US00	5000000766	2014		2,000.00	USD	10/06/2014	NA00		0000310000
204	US00	5000000767	2014		2,000.00	USD	10/06/2014	NA00		0000310000
204	US00	5000000767	2014		2,000.00	USD	10/06/2014	NA00		0000310000
204	US00	5000000768	2014		6,400.00	USD	10/10/2014	NA00		0000310000
204	US00	5000000769	2014		2,000.00	USD	10/28/2014	NA00		0000310000
204	US00	5000000769	2014		2,000.00	USD	10/28/2014	NA00		0000310000
204	US00	5000000770	2014		3,200.00	USD	11/06/2014	NA00		0000310000
204	US00	5000000771	2014		3,200.00	USD	11/06/2014	NA00		0000310000
204	US00	5100000420	2014		3,200.00	USD	02/03/2014	NA00		0000310000
204	US00	5100000421	2014		3,200.00	USD	02/03/2014	NA00		0000310000
204	US00	5100000422	2014		3,200.00	USD	02/04/2014	NA00		0000310000
204	US00	5100000423	2014		3,200.00	USD	02/04/2014	NA00		0000310000
204	US00	5100000424	2014		3,200.00	USD	02/04/2014	NA00		0000310000
204	US00	5100000425	2014		3,200.00	USD	02/04/2014	NA00		0000310000
204	US00	5100000426	2014		3,200.00	USD	02/04/2014	NA00		0000310000
204	US00	5100000427	2014		3,200.00	USD	02/04/2014	NA00		0000310000
204	US00	5100000428	2014		3,200.00	USD	02/04/2014	NA00		0000310000

Figure 23. Table BSEG After Choosing Fields

Figure 23 shows that the chosen fields are MANDT, BUKRS, BELNR, GJAHR, GSBER, PSWBT, PSWSL, VALUT, KOKRS, KOSTL and HKONT. For more explanation regarding these tables please check Appendix 2. BSEG field labels. The actual extraction process happens with one single right click on the fields -> Download -> Spreadsheet -> desired destination.

The downloaded spreadsheet marks the end of the extraction process, which has been done manually because there is no actual automated connection from SAP ERP to Microsoft Power Pivot. The next process in this study is the transformation of general ledger data using Microsoft Power Pivot.

### 5.3 Transformation of General Ledger Data using Microsoft Power Pivot

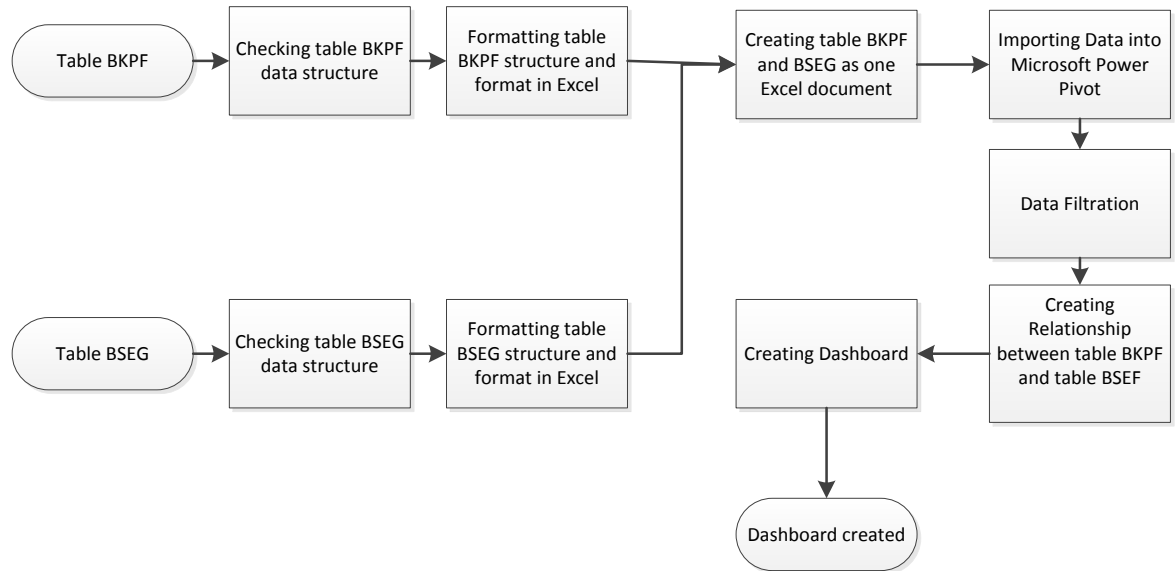


Figure 24. Transformation of General Ledger Data using Microsoft Power Pivot

The initial process of the transformation of general ledger data is marked by opening spreadsheets for table BKPF and table BSEG, and followed by the checking table BKPF and table BSEG data structures and formats.

Figure 25. Extracted Table BKPF and Table BSEG Before Formatting

Figure 25 shows that the extracted table BKPF and table BSEG are not exactly in the right structure and format for importing to Power Pivot therefore some manual data formations have to be done.

Data formations consist of deleting unnecessary headers and lines, checking the right formats for dates, numbers and texts, and followed by formatting the data as tables, table BKPF and table BSEG respectively.

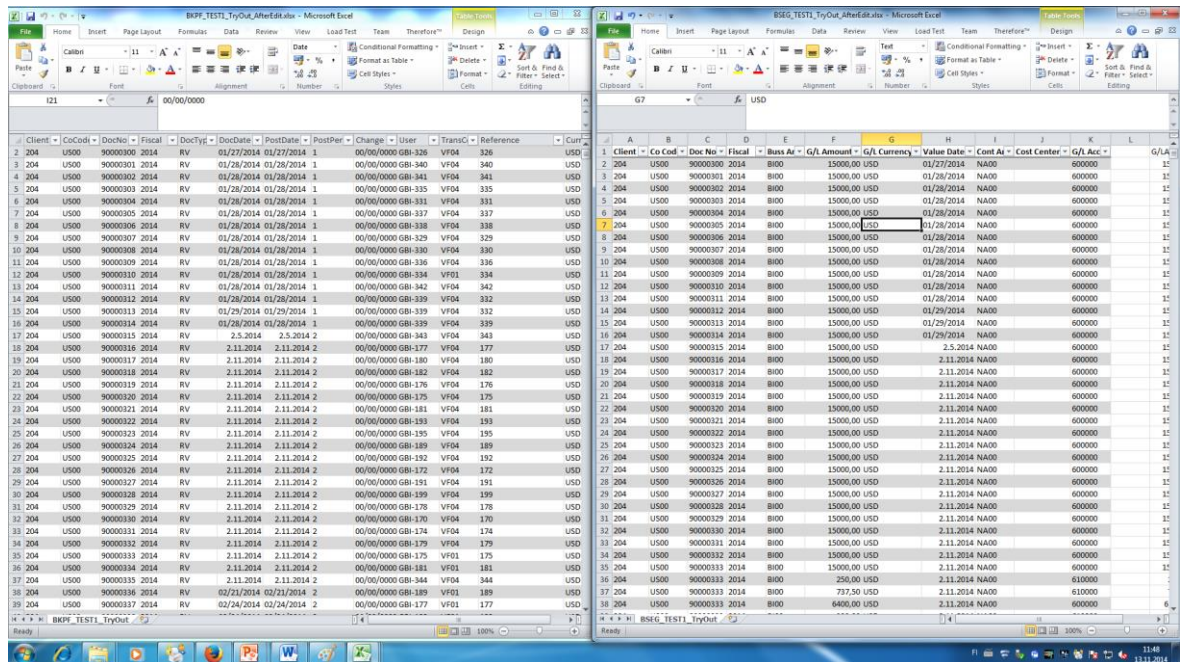


Figure 26. Table BKPF and Table BSEG After Formatting

Figure 26 shows table BKPF and table BSEG after the formatting process, unnecessary headers and lines were deleted and the G/L Amount cell in table BSEG was formatted to European standard such as 15000,00 instead of 15,000.00 so that Power Pivot can recognize the numbers. The substitute formula is as followed =--SUBSTITUTE(SUBSTITUTE(M2; ";"; ""; 1); "."; ",", 1).

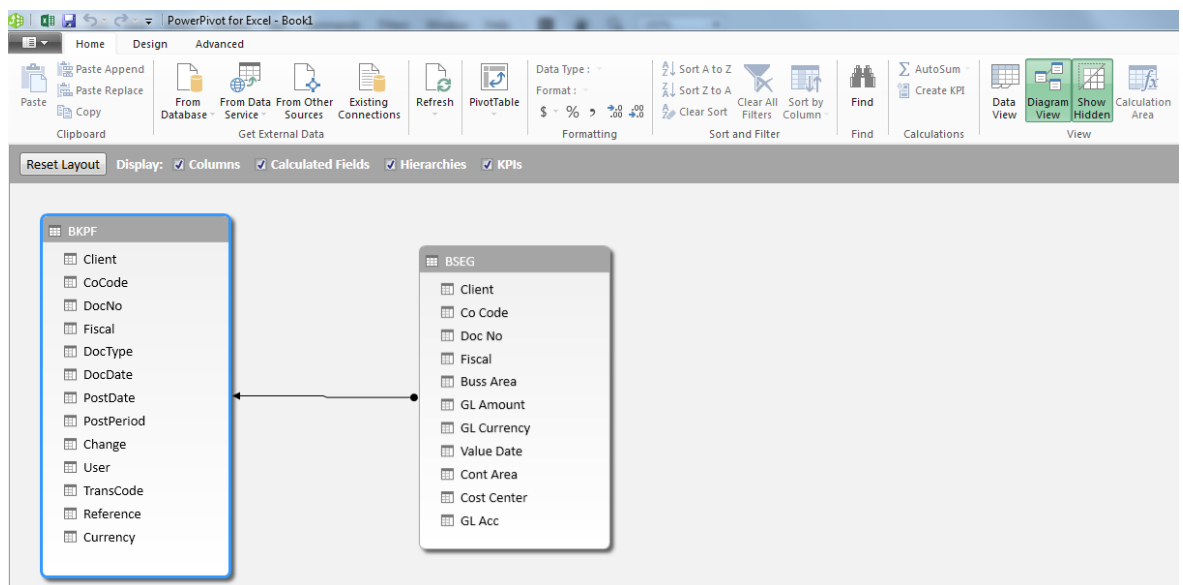
After the formatting process the next process is creating table BKPF and table BSEG as one Excel document. The process is done through Excel key “ALT+D+D”. ALT+D+D key commands table BSEG to be created as one workbook with table BKPF. This is done so that both table BKPF and table BSEG would be located in one

Excel workbook in order to import the tables to Power Pivot and to create a relationship between table BKPF and table BSEG.

Importing data into Microsoft Power Pivot is done through process Power Pivot Tab -> Manage -> From Other Sources -> Excel File -> Excel File Path (Use first row as column header) -> Choose Source Table -> Filter if needed -> Finish.

When both tables have been imported to Power Pivot, the first thing to remember is to create relationship between tables. Create relationship is done through Power Pivot Design Tab -> Create Relationship -> Choose table BKPF, Column DocNo and table BSEG Column Doc No -> Create.

Doc No is the unique key in both tables because there is only one single document number for each business transaction.



**Figure 27. Table BKPF and Table BSEG Relationship Diagram**

Figure 27 shows the relationship diagram between table BKPD and table BSEG. Figure 27 also shows the fields that are included in both table BKPF and table BSEG. Table BKPF consists of Client, CoCode, DocNo, Fiscal, DocType, DocDate, PostDate, PostPeriod, Change, user, TransCode, Reference and Currency. Meanwhile table

BSEG consists of Client, CoCode, Doc No, Fiscal, Buss Area, GL Amount, GL Currency, Value Date, Cont Area, Cost Center and GL Acc.

The final process of the data transformation is the creation of the dashboard in Power Pivot. In order to view the business transactions scenario that was done before these columns were chosen from both tables:

**Table 2. Table BKPF and Table BSEG Columns**

Number	Table BKPF	Table BSEG
1	Client	Doc No
2	CoCode	GL Amount
3	Fiscal	GL Currency
4	DocType	Cont Area
5	User	GL Acc
6	TransCode	
7	Reference	

Table 2 shows the required columns for creating dashboard from table BKPF and table BSEG, these columns were chosen because they include the information needed in order to create an analysis and reporting in Power Pivot Dashboard.

**Table BKPF**

- Client represents the highest hierarchy that is given for an organization, the client for this scenario is 204 (Global Bike Incorporated).
- CoCode is the company code in which the transaction takes place, US00 (GBI US).
- Fiscal is the fiscal year that the transaction takes place, 2014.
- DocType is the type of the document used for the transaction, SA indicates that the document is G/L Account Document.
- User is the user responsible for the transaction which is user GBI-183.
- TransCode is the transaction code used in the SAP ERP Transaction Code, the transaction code used was FB50 for Enter G/L Account Document.
- Reference given was 183.

## Table BSEG

- Doc No is the Document Number given by the SAP ERP system after the transaction has been executed, there are two Document Numbers in this scenario 100000742 for the post transfer of funds and 100000747 for post paying bike transport.
- GL Amount is the amount of the General Ledger that is used for the transaction, for document number 100000742 the amount is \$ 5000,00 while for document number 100000747 the amount is \$80,00.
- GL Currency indicates the currency used for the transactions.
- Cont Area is the organizational unit that represents accounting component in SAP ERP, in this transaction no controlling area was used
- GL Acc are the list of general ledger accounts that are involved in the transaction, for document number 100000742 the general ledger accounts are 100645 and 100785 while for document number 100000747 the general ledger accounts are 100645 and 300200.

## Power Pivot Dashboard

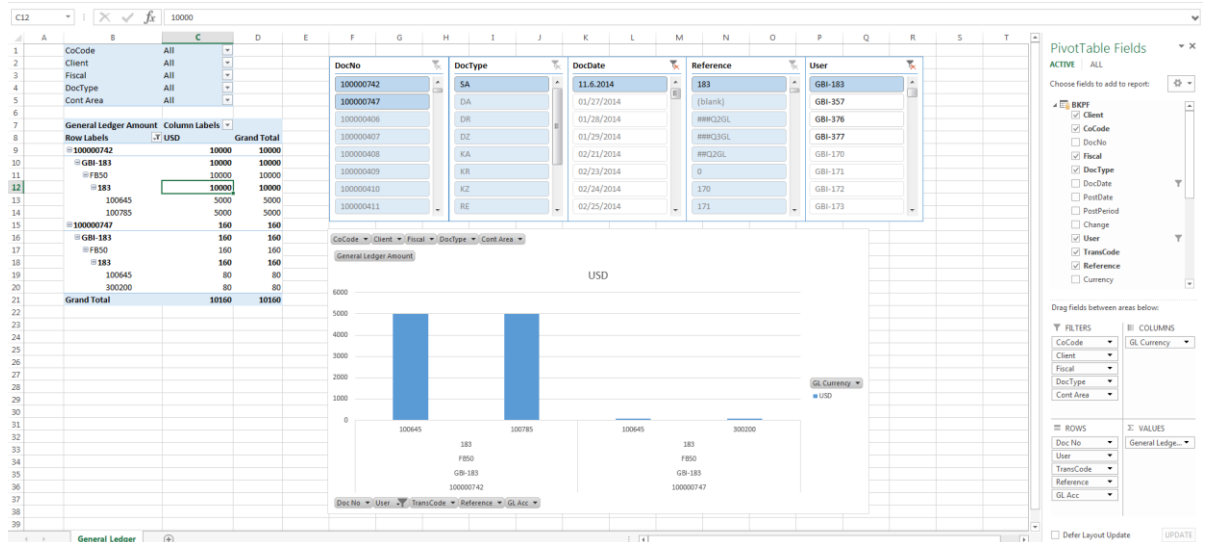


Figure 28. General Ledger Power Pivot Dashboard

Figure 28 shows the Power Pivot dashboard resulted from business transaction scenario display and transfer of GBI general ledger data. The Power Pivot dashboard consists of five slicers, DocNo, DocType, DocDate, Reference and User. Slicers are used to filter data in Power Pivot workbook, filters also indicate the current filtering state

which makes it easy to understand what exactly is shown in a filtered PivotTable report. (Microsoft Office Support 2014b.)

The dashboard shows the general ledger amount in USD for document number 100000742 and 100000747, it includes the reference, user responsible, SAP transaction code and document date. Document number 100000742 consists of general ledger account 100645 and 100785, while document number 100000747 consists of general ledger account 100645 and 300200.

The dashboard shows that for both documents there is a balance in both debit and credit accounts resulted from general ledger accounting. For document number 100000742, the debit amount is \$5000,00 for account 100645 and the credit amount is \$5000,00 for account 100785. Meanwhile for document number 100000747, the debit amount is \$80,00 for account 300200 and the credit amount is \$80,00 for account 100645.

## **5.4 Power View and Power BI**

### **Power View**

Power View is a feature for Office 365 and Excel 2013 that enables interactive data exploration, visualization, and presentation experience that encourage intuitive ad-hoc reporting. (Microsoft Office Support 2014c.) Power View works as a self-service alternative for BI visualization and presentation layers through the extension of charts, reports and maps capabilities. Power View enables the users to display and present their data in more stylish manners without eliminating the main idea of BI that is a fast and simple data presentation for analysis and reporting.

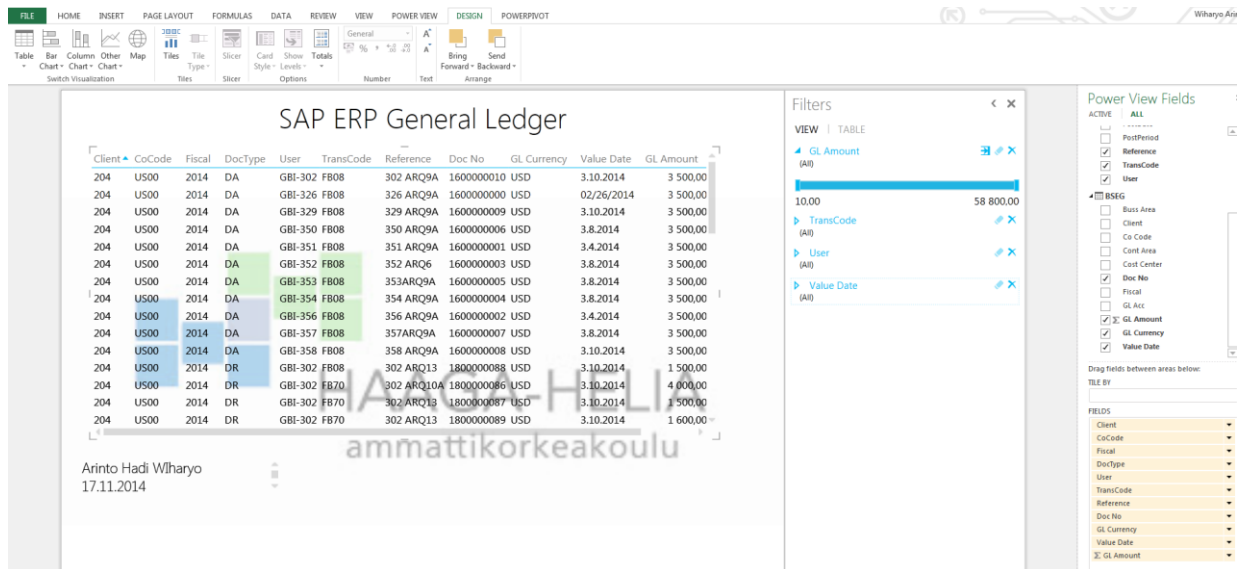


Figure 29. SAP ERP General Ledger Power View

Figure 29 shows the use of Power View for SAP ERP general ledger data. Instead of showing the data in Excel, Power View is capable of showing the data in more attractive and informative ways. Power View allows the users to set image background as shown in figure 29 and adding text box for notes. The filters are located next to the table in an alphabetic order and the fields are shown in the bottom right of the Power View. There are other data presentations in Power View, they are located in design tab on tab selections. Other data presentations that Power View serves to its users are bar charts, column charts and maps.

## Power BI

Power BI is a collection of features and services created for Office 365 that enables visualization of data, share, discoveries, and collaboration in intuitive many ways. It provides an organization-wide-self-service BI infrastructure and brings Excel workbook sharing, online collaboration, and IT infrastructure together into a holistic offering. (Microsoft Office Support 2014d.) The main features that distinguishes Power BI is its ability that allows the users to share, collaborate, track and communicate in one Power BI workbook.

HAAGA-HELIA UAS' utilizes its SharePoint as a module for sharing, collaborating, tracking and communicating in Power BI workbook. HAAGA-HELIA UAS's Power



BI is a licensed based feature that is given for students or teachers by HAAGA-HELIA UAS' IT Help Desk.

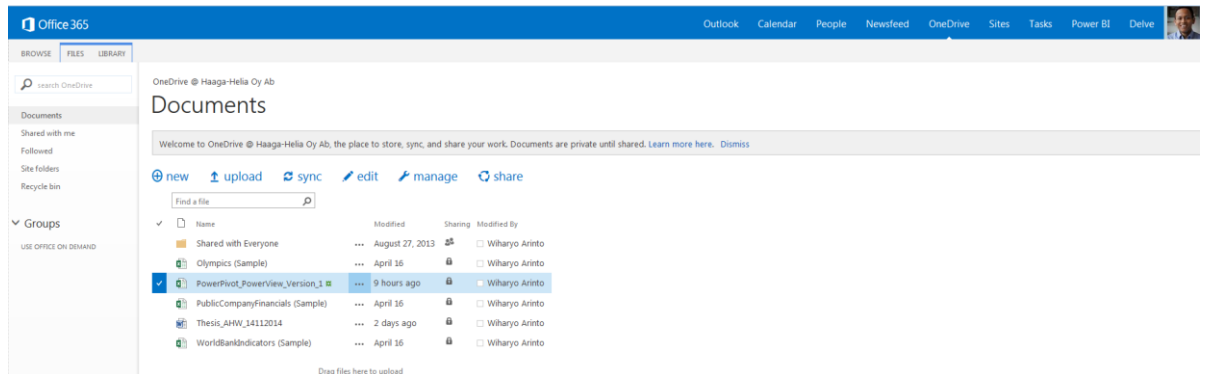


Figure 30. HAAGA-HELIA UAS SharePoint

Figure 30 shows one of many SharePoint functionalities that is the management of documents in HAAGA-HELIA UAS's SharePoint, the users have the capabilities of uploading, sync, edit, manage or share the desired document with other users.

The SharePoint address is

[https://haagahelia-my.sharepoint.com/personal/a1003558\\_myy\\_haaga-helia\\_fi](https://haagahelia-my.sharepoint.com/personal/a1003558_myy_haaga-helia_fi)

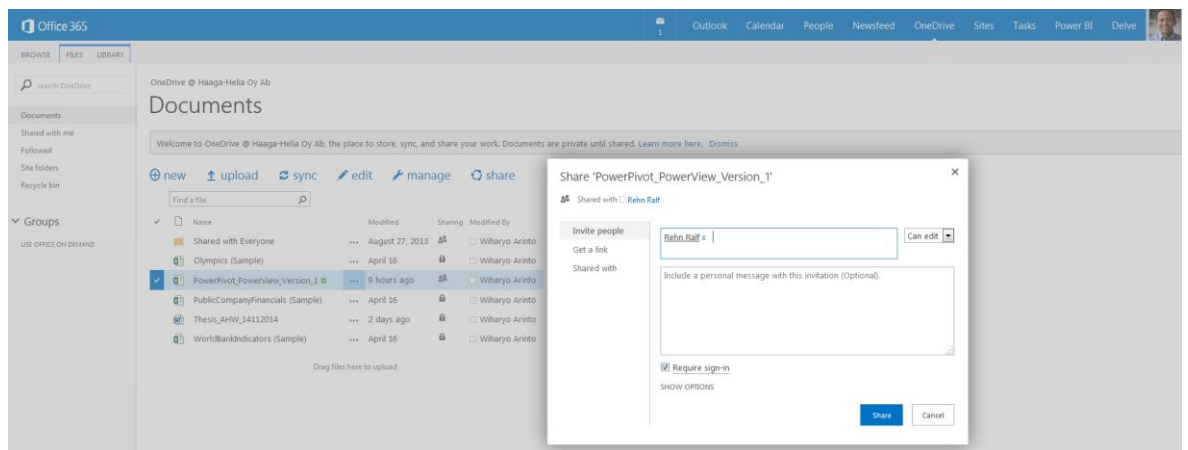


Figure 31. HAAGA-HELIA SharePoint Share Functionality

Figure 31 shows the share functionality by creating an invitation to other user, Power Pivot and Power View workbook is shared with the thesis advisor, Ralf Rehn. The workbook is non-visible unless it is shared with others.

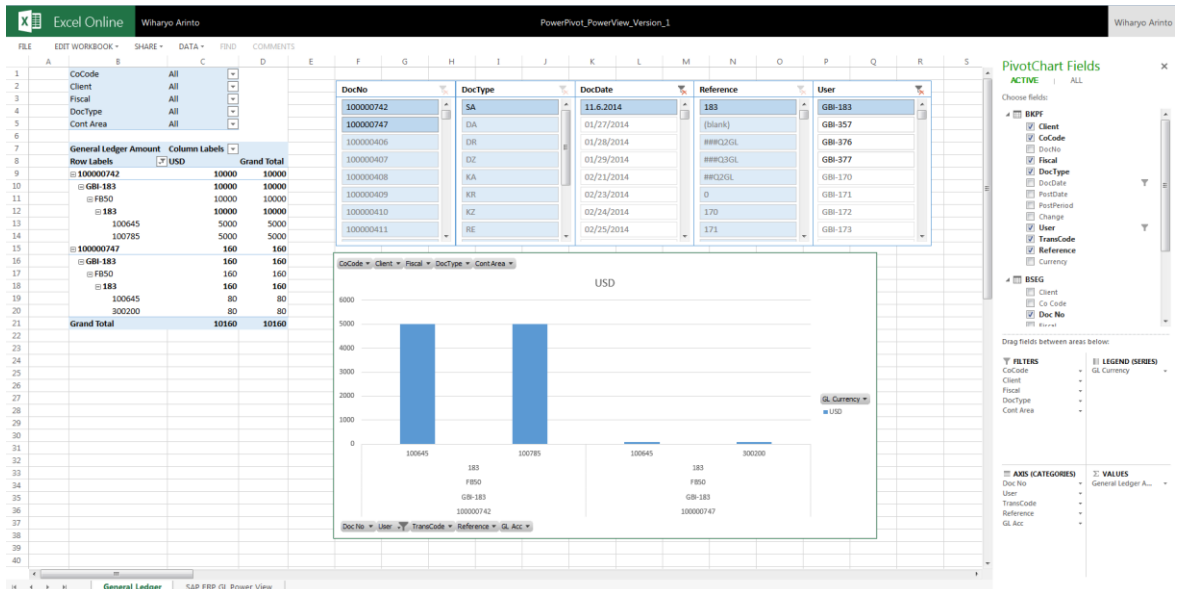


Figure 32. Power Pivot Visualization in Power BI

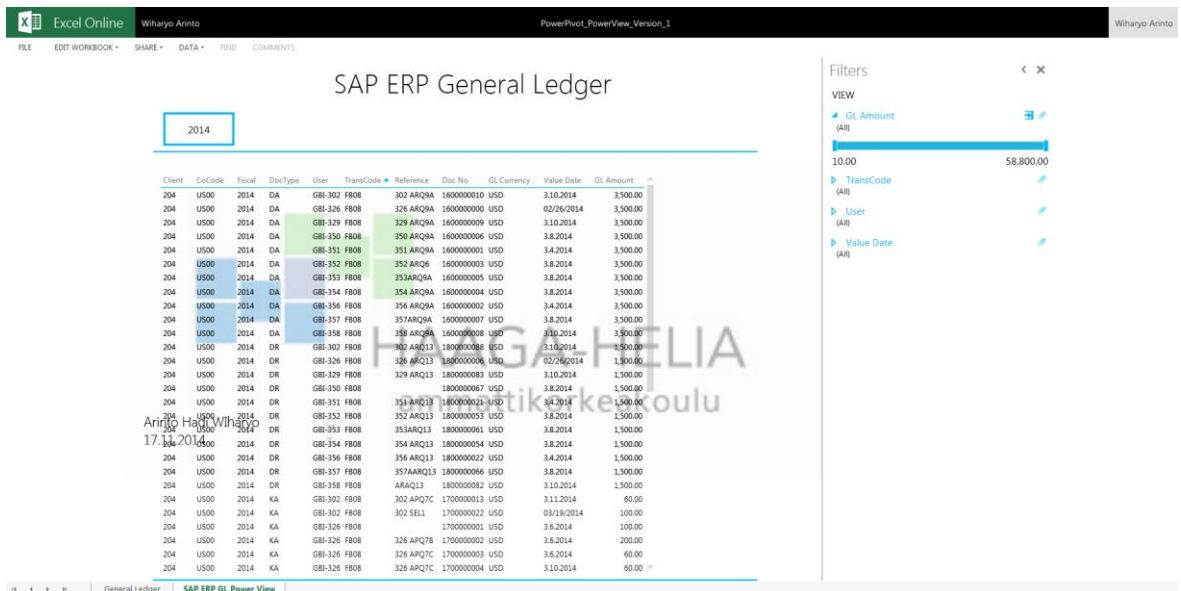


Figure 33. Power View Visualization in Power BI

Despite the fact that the Power BI full features were not granted, figure 32 and figure 33 show that data visualizations are still visible for the users. Thesis advisor was able to display the document in Excel online. Figure 32 and figure 33 show the visualizations of the Power Pivot and Power View respectively in SharePoint, both figures show the abilities of Power BI to visualize, share, discover and collaborate data between users.

## 6 Discussion

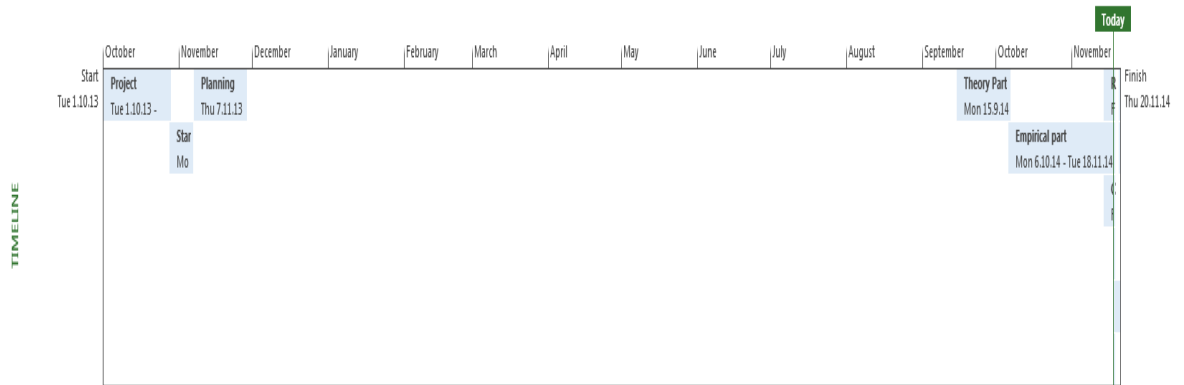
This study has been conducted through a qualitative research based on the combination of theoretical and empirical study. The theoretical study is focused on literature analysis based on chosen topics, ETL, SAP ERP, Microsoft Power Pivot and general ledger accounting. The theoretical study was conducted by observation of the courses taken in HAAGA-HELIA UAS, books, articles and internet sources and it works as the foundation of the empirical study. The empirical study is done through try outs, data collections and the practical approaches of the chosen topics.

The theoretical study has shown that Business Intelligence has successfully bring new functionalities for analysis, reporting and decision making in a fast, simple and efficient way through the utilization of data warehouse and ETL process. The most common data presentation in BI is through a dashboard that typically contains tables and charts with slicers.

The empirical study that consists of business transaction scenario, the extraction of general ledger data from SAP ERP, the data transformation and loading using Microsoft Power Pivot have proven that Enterprise Resource Planning and Business Intelligence can bring big advantages in providing organizations with reporting and analyzing tool in centralized and integrated systems.

The weaknesses of this study emerged in the methodology applied and the non-existence of the commissioning party. There is an access limitation to SAP ERP database in Magdeburg, Germany and as a result the general ledger data has to be extracted manually from SAP ERP. It took quite some time to discover the way to extract the data from SAP ERP through many data extractions try outs, because SAP ERP is a huge and multi-hierarchical system that requires specific trainings and skills.

A lack of a commissioning party has caused a lack of attention in the project management and schedule that has made this study pending and on-going for quite a long time.



**Figure 34. Thesis Timeline**

The study started in October 2013 and it was completed in November 2014, despite the 400 working hours suggested by HAAGA-HELIA UAS. Figure 34 shows that there is a big gap in between planning of the thesis and the conducting of the theory part. During the gap in the thesis timeline I felt that I had no obligations to finish the thesis by the proposed deadline which was April 2014, later on I realized the importance of this thesis and I started doing the thesis again in September 2014. My advice for other students who are currently writing their thesis is to fully concentrate on their thesis and find the suitable commissioning party that would push them on working on their thesis and delivering the results by the deadline.

The limitations of this study lie on the scope and the availability of the licenses given. The scope of this study was constantly changing until finally it was decided that it should cover, SAP ERP, Microsoft BIs, ETL process, data warehouse and general ledger accounting. However a better study could be conducted with more depth research that includes deeper insights of ERP and BI systems and a better scenario of the accounting process. The licenses given for both SAP ERP and Microsoft BIs were intended only for education purposes therefore some functionality might not be utilized during this study.

Lots of improvement can be done for this study such as a creation of a case study conducted for a commissioning party that includes more data sources and also comparisons between ERP systems and comparisons between BI systems, such as comparisons of SAP ERP to Microsoft Dynamics NAV and Microsoft BIs to SAP Business Objects.

This study has been conducted according to the scope however some things were left out of scope in order to focus on the research questions. Scorecards, KPIs, and OLTP and OLAP were left out scope despite the fact that they are part of the BI and bring more knowledge to the readers; they were left out of scope in order to limit the number of pages as the deadline is approaching for this study. Power View and Power BI are available for students and lecturers and they give more knowledge and skills to the readers of this study, therefore both were explained in brief and short chapters.

Last but not least this study has given a vast amount of knowledge on the chosen topics. Not only that this study has allowed me to conduct theoretical and empirical researches despite all the limitations and challenges, this study has allowed me to explore my knowledge and interest in financial accounting, ERP and BI systems. It is hoped that this study would be useful for my future studies and career, and to all the readers.

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# Appendices

## Appendix 1. Table BKPF Field Labels

Field Name	Field Label
MANDT	Client
BUKRS	Company Code
BELNR	Document Number
GJAHR	Fiscal Year
BLART	Document Type
BLDAT	Document Date
BUDAT	Posting Date
MONAT	Posting Period
CPUDT	Entry Date
CPUTM	Time of Entry
AEDAT	Changed on
UPDDT	Last update
WWERT	Translation Date
USNAM	User Name
TCODE	Transaction Code
BVORG	Cross-co. code no.
XBLNR	Reference
DBBLG	Recurring entry doc.
STBLG	Reversed with
STJAH	Year
BKTXT	Document Header Text
WAERS	Currency
KURSF	Exchange rate
KZWRS	Group currency
KZKRS	Group exch.rate
BSTAT	Doc.status
XNETB	Net document type
FRATH	Unpl. del.costs
XRUEB	Document is back-posted
GLVOR	Business Transaction
GRPID	Session name
DOKID	Document name
ARCID	Extract ID
IBLAR	Internal document type
AWTYP	Reference Transact.
AWKEY	Reference Key
FIKRS	FM Area
HWAER	Local Currency
HWAE2	Local currency 2
HWAE3	Local currency 3
KURS2	Exchange rate 2
KURS3	Exchange rate 3
BASW2	Source currency
BASW3	Source currency
UMRD2	Translation date
UMRD3	Translation date
XSTOV	Reversal flag
STODT	Reverse posting date
XMWST	Calculate tax
CURT2	LC2 currency type

CURT3	LC3 currency type
KUTY2	Exchange Rate Type
KUTY3	Exchange Rate Type
XSNET	Calculate taxes on net amount
AUSBK	Source company code
XUSVR	Tax details changed
DUEFL	Status of Transfer to Subsequent Release
AWSYS	Logical System
TXKRS	Rate for taxes
LOTKZ	Request Number
XWVOF	B/ex.before due date
STGRD	Reversal Reason
PPNAM	Parked by
BRNCH	Branch number
NUMPG	Number of Pages
ADISC	discount document
XREF1_HD	Ref.key (header) 1
XREF2_HD	Ref.key (header) 2
XREVERSAL	Reversal Indicator
REINDAT	Invoice receipt date
RLDNR	Ledger
LDGRP	Ledger Group
PROPMANO	Mandate Thrd Prty Mgmt
XBLNR_ALT	Alt Reference Number
VATDATE	Tax Reporting Date
DOCCAT	Doc.Type
XSPLIT	Split Posting
/SAPF15/STATUS	Document Status
PSOTY	Request Category
PSOAK	Reason
PSOKS	Region
PSOSG	Reason for reversal
PSOFN	File number
INTFORM	Interest Formula
INTDATE	Interest Calc. Date
PSOBT	Posting Day
PSOZL	Actual posting
PSODT	Changed on
PSOTM	Changed at
FM_UMART	Transfer type
CCINS	Card type
CCNUM	Card number
SSBLK	Payment Sampling Block
BATCH	Lot number
SNAME	User Name
SAMPLED	Sampled invoice by Payment Stat. Samplin
EXCLUDE_FLAG	PPA Exclude Ind.
BLIND	Budgetary Ledger Indicator
OFFSET_STATUS	Treasury Offset Status
OFFSET_REFERER_DAT	Date Record Referred to Treasury
PENRC	Reason for Late Pmnt
KNUMV	Doc. condition no.

## Appendix 2. Table BSEG Field Labels

	Field Name	Field Label
X	MANDT	Client
X	BUKRS	Company Code
X	BELNR	Document Number
X	GJAHR	Fiscal Year
X	BUZEI	Line item
X	BUZID	Line item ID
X	AUGDT	Clearing date
X	AUGCP	Clearing Entry Date
X	AUGBL	Clearing Document
X	BSCHL	Posting Key
X	KOART	Account Type
X	UMSKZ	Special G/L ind.
X	UMSKS	Sp.G/L trans.type
X	ZUMSK	Trgt special G/L ind
X	SHKZG	Debit/Credit Ind.
X	GSBER	Business Area
X	PARGB	Trading Part.BA
X	MWSKZ	Tax code
X	QSSKZ	Withholding Tax Code
X	DMBTR	Amount in LC
X	WRBTR	Amount
X	KZBTR	Orig.reduction amnt
X	PSWBT	General ledger amount
X	PSWSL	General ledger currency
X	TXBHW	Original tax base amount
X	TXBFW	Original tax base amount
X	MWSTS	LC tax amount
X	WMWST	Tax Amount
X	HWBAS	LC tax base amount
X	FWBAS	Tax base amount
X	HWZUZ	LC provision
X	FWZUZ	Additional tax
X	SHZUZ	Cash discount (+/-)
X	STEKZ	Version Number Component
X	MWART	Tax type
X	TXGRP	Group indicator
X	KTOSL	Transaction
X	QSSHB	Withhold.tax base
X	KURSR	Hedged exchange rate
X	GBETR	Hedged amount
X	BDIFF	Valuation difference
X	BDIFF2	Valuation difference 2
X	VALUT	Value Date
X	ZUONR	Assignment
X	SGTXT	Text
X	ZINKZ	Interest Block
X	VBUND	Trading Partner
X	BEWAR	Transaction Type
X	ALTKT	Group Account Number
X	VORGN	G/L Transaction Type
X	FDLEV	Planning Level
X	FDGRP	Planning Group
X	FDWBT	Planned Amount
X	FDTAG	Planning Date
X	FKONT	Financial budget
X	KOKRS	Controlling Area
X	KOSTL	Cost Center

X	PROJN	not in use
X	AUFNR	Order
X	VBELN	Billing Document
X	VBEL2	Sales Document
X	POSN2	Sales Document Item
X	ETEN2	Schedule Line Number
X	ANLN1	Asset
X	ANLN2	Subnumber
X	ANBWA	Transact. type
X	BZDAT	Asset Value Date
X	PERNR	Personnel Number
X	XUMSW	Sales-Related
X	XHRES	Indicator: Resident G/L Account?
X	XKRES	Line item display
X	XOPVW	Open Item Management
X	XCPDD	Individ. Set
X	XSKST	CCTRPostingStatist
X	XSAUF	Order Post.Statist.
X	XSPRO	Proj. Posting Stat
X	XSERG	PA Posting Stat.
X	XFAKT	Indicator: Billing Document Update Successful?
X	XUMAN	Indicator: Transfer Posting from Down Payment?
X	XANET	Indicator: Down Payment in Net Procedure?
X	XSKRL	W/o Cash Dscnt
X	XINVE	Investment ID
X	XPANZ	Display Item
X	XAUTO	Line Item Automatically Created
X	XNCOP	Indicator: Items Cannot Be Copied?
X	XZ AHL	Payment Transaction
X	SAKNR	G/L Account
X	HKONT	G/L Account
X	KUNNR	Customer
X	LIFNR	Vendor
X	FILKD	Branch account
X	XBILK	Balance Sheet Account
X	GVTYP	P&L Statement Acct Type
X	HZUON	Spec1 G/L assgt
X	ZFB DT	Baseline Payment Dte
X	ZTERM	Terms of Payment
X	ZBD1T	Days 1
X	ZBD2T	Days 2
X	ZBD3T	Days net
X	ZBD1P	Discount Percent 1
X	ZBD2P	Discount Percent 2
X	SKF BT	Discount base
X	SKN TO	Cash Discount Amount
X	WSK TO	Discount Amount
X	ZLSCH	Payment Method
X	ZLS PR	Payment Block
X	ZB FIX	Fixed
X	HBK ID	House Bank
X	BV TYP	Partner Bank Type
X	NEB TR	Payment amount
X	MWSK1	Tax code
X	DMB T1	Amount
X	WRB T1	Amount
X	MWSK2	Tax code
X	DMB T2	Amount
X	WRB T2	Amount
X	MWSK3	Tax code

X DMBT3	Amount
X WRBT3	Amount
X REBZG	Invoice reference
X REBZJ	Fiscal year
X REBZZ	Line item
X REBZT	Follow-on doc.type
X ZOLLT	Customs tariff no.
X ZOLLD	Customs date
X LZBKZ	SCB Indicator
X LANDL	Supplying Cntry
X DIEKZ	Service Indicator
X SAMNR	Collective invoice
X ABPER	Settlmnt Period
X VRSKZ	Insurance Ind.
X VRSDT	Insurance Date
X DISBN	Usage document
X DISBJ	Year
X DISBZ	Discount line item
X WVERW	Bill/Exchange Usage
X ANFBN	B/e payment request
X ANFBJ	Fiscal yr
X ANFBU	Company code
X ANFAE	Return before
X BLNBT	Preference amount
X BLNKZ	Subsidy indic.
X BLNPZ	Pref.percentage rate
X MSCHL	Dunning Key
X MANSF	Dunning Block
X MADAT	Last Dunned
X MANST	Dunning Level
X MABER	Dunning Area
X ESRNR	ISR Number
X ESRRE	ISR Reference Number
X ESRPZ	Check Digit
X KLIBT	Credit control amnt
X QSZNR	Exemption number
X QBSHB	Withholding tax amnt
X QSFBT	Wthld.tax-exempt amt
X NAVHW	Non-deductible
X NAVFW	Nondeductible
X MATNR	Material
X WERKS	Plant
X MENGE	Quantity
X MEINS	Base Unit of Measure
X ERFMG	Qty in Un. of Entry
X ERFME	Unit of Entry
X BPMNG	Qty in OPUn
X BPRME	Order Price Unit
X EBELN	Purchasing Document
X EBELP	Item
X ZEKKN	Seq. No. of Account Assgt
X ELIKZ	Delivery Completed
X VPRSV	Price Control
X PEINH	Price Unit
X BWKEY	Valuation Area
X BWTAR	Valuation Type
X BUSTW	Value String
X REWRT	Invoice Value
X REWWR	Invoice Value in FC
X BONFB	Amount
X BUALT	Amount
X PSALT	Alt. price control

X NPREI	New Price
X TBTKZ	Subseq. Debit/Credit
X SPGRP	Blocking Reas. Price
X SPGRM	Blocking Reason: Qty
X SPGRT	Block. Reason: Date
X SPGRG	Blocking Reason:OPQ
X SPGRV	Blocking Reas: Proj.
X SPGRQ	Manual Block. Reason
X STCEG	VAT Registration No.
X EGBLD	Country of destinat.
X EGLLD	Supplying country
X RSTGR	Reason code
X RYACQ	Year of acquisition
X RPACQ	Per. of Acquisition
X RDIFF	Difference realized
X RDIF2	Realized difference 2
X PRCTR	Profit Center
X XHKOM	Manual G/L Account
X VNAME	Joint Venture
X RECID	Recovery Indicator
X EGRUP	Equity Group
X VPTNR	Partner
X VERTT	Contract Type
X VERTN	Contract Number
X VBEWA	Flow Type
X DEPOT	Securities Account
X TXJCD	Tax Jurisdiction
X IMKEY	Real Estate Key
X DABRZ	Reference Date
X POPTS	Option Rate
X FIPOS	Commitment Item
X KSTRG	Cost Object
X NPLNR	Network
X AUFPL	Task List No. Oper.
X APLZL	Counter
X PROJK	WBS Element
X PAOBJNR	Profitab. Segmt No.
X PASUBNR	Subnumber
X SPGRS	Blkg Reason: Item Amount
X SPGRC	BlockReason:Quality
X BTYPE	Billing indicator
X ETYPE	Equity Type
X XEGDR	EU triangular deal
X LNRAN	Sequence Number
X HRKFT	Origin group
X DMBE2	LC2 amount
X DMBE3	LC3 amount
X DMB21	Amount
X DMB22	Amount
X DMB23	Amount
X DMB31	Amount
X DMB32	Amount
X DMB33	Amount
X MWST2	LC2 tax amount
X MWST3	LC3 tax amount
X NAVH2	LC2 nondeductible
X NAVH3	LC3 nondeductible
X SKNT2	LC2 cash disc.amnt
X SKNT3	LC3 cash disc.amnt
X BDIF3	Valuation difference 3
X RDIF3	Difference realized 3
X HWMET	Method with Which the Local Currency Amount

X	GLUPM	Was Determined
X	XRAGL	Update Method
X	UZAWA	Reverse clearing
X	LOKKT	Pmt meth. supplement
X	FISTL	Alternative Account No.
X	GEBER	Funds Center
X	STBUK	Fund
X	TXBH2	Tax company code
X	TXBH3	LC2 tax base amount
X	PPRCT	LC3 tax base amount
X	XREF1	Partner Profit Ctr
X	XREF2	Reference Key 1
X	KBLNR	Reference Key 2
X	KBLPOS	Earmarked Funds
X	STTAX	Document item
X	FKBER	Statistical Tax Amount in Document Crcy
X	OBZEI	Functional Area
X	XNEGP	Original item
X	RFZEI	Negative posting
X	CCBTC	Pmnt card line item
X	KKBER	Settlement run
X	EMPFB	Credit Control Area
X	XREF3	Payee
X	DTWS1	Reference Key 3
X	DTWS2	Instruction Key 1
X	DTWS3	Instruction Key 2
X	DTWS4	Instruction Key 3
X	GRICD	Instruction Key 4
X	GRIRG	Activity Code GI Tax
X	GITYP	Region
X	XPYPR	Distribution Type
X	KIDNO	Payment sent
X	ABSBT	Payment reference
X	IDXSP	Hedged Amount
X	LINFV	Inflation Index
X	KONTT	Last Adjustment Date
X	KONTL	Acct Assignment Cat.
X	TXDAT	Account Assignment
X	AGZEI	Tax Date
X	PYCUR	Clearing item
X	PYAMT	Pmnt currency
X	BUPLA	Pmnt curr. amnt
X	SECCO	Business Place
X	LSTAR	Section Code
X	CESSION_KZ	Activity Type
X	PRZNR	Accts rble pled.ind.
X	PPDIFF	Business Process
X	PPDIF2	Diff. realized
X	PPDIF3	Diff. realized
X	PENLC1	Diff. realized
X	PENLC2	Penalty Chge in LC
X	PENLC3	Pen.Charge in LC2
X	PENFC	Pen.Charge in LC3
X	PENDAYS	Penalty Charge
X	PENRC	Days in Arrears
X	GRANT_NBR	Reason for Late Pmnt
X	SCTAX	Grant
X	FKBER_LONG	Tax Portion FI-CA Local Currency
X	GMVKZ	Functional Area
X	SRTYPE	Transfer to Execution
X	INTRENO	Type of Addtnl Recvabl
		Real estate code



X MEASURE	Funded Program
X AUGGJ	Clearing Fiscal Year
X PPA_EX_IND	PPA Exclude Ind.
X DOCLN	Line Item
X SEGMENT	Segment
X PSEGMENT	Partner Segment
X PFKBER	Partner Func. Area
X HKTID	Account ID
X KSTAR	Cost Element
X XLGCLR	Ledger Group-Specific Clearing
X TAXPS	Document item number for tax document.
X XFRGE_BSEG	Payment Is Released
X MNDID	Mandate Reference
X PGEBER	Partner Fund
X PGRANT_NBR	Partner Grant
X BUDGET_PD	Budget Period
X PBUDGET_PD	Par. Budget Per.
X PEROP_BEG	Billing Period of Performance Start Date
X PEROP_END	Billing Period of Performance End Date
X FASTPAY	Fast Pay Indicator
X PRODPER	Production Month

### Appendix 3. SAP Document Types

Transaction OBA7 -> Print -> Word Processing -> Create Document

The screenshot shows the SAP 'Change View Document Types: Overview' window. The window title is 'Change View "Document Types": Overview'. The menu bar includes 'Table View', 'Edit', 'Goto', 'Selection', 'Utilities(M)', 'System', and 'Help'. The toolbar contains icons for search, back, save, refresh, delete, print, and zoom. Below the toolbar is a 'New Entries' button and several document type icons. The main area is a table with two columns: 'Type' and 'Description'. The 'KP' entry, 'Account Maintenance', is highlighted in yellow. At the bottom, there is a 'Position...' button and the text 'Entry 1 of 38'.

Type	Description
AA	Asset Posting
AB	Accounting Document
AF	Depreciation Pstngs
AN	Net Asset Posting
CH	Contract Settlement
DA	Customer Document
DG	Customer Credit Memo
DR	Customer Invoice
DZ	Customer Payment
EU	Euro Rounding Diff.
EX	External Number
KA	Vendor Document
KG	Vendor Credit Memo
KN	Net Vendors
KP	Account Maintenance
KR	Vendor Invoice
KZ	Vendor Payment
ML	ML Settlement
PR	Price Change
RA	Sub.Cred.Memo Stmt
RB	Reserve for Bad Debt
RE	Invoice - Gross
RN	Invoice - Net
RV	Billing Doc.Transfer
SA	G/L Account Document
SB	G/L Account Posting
SK	Cash Document
SU	Adjustment Document
UE	Data Transfer
WA	Goods Issue
WE	Goods Receipt
WI	Inventory Document
WL	Goods Issue/Delivery
WN	Net Goods Receipt
ZP	Payment Posting
ZR	Bank Reconciliation
ZS	Payment by Check

## Appendix 4. Data Extractions Try Outs

### Transaction FBL3N

Accounts 60000 to 740700

Company Code US00

Ss	Assignments	DocumentNo	Busk	Type	Doc. Date	FK	Amount in local cur.	LCurr	Clang doc.	Text
		90000001	B100	SV	09/09/2011	50	15,000.00	USD		
		90000002	B100	SV	09/09/2011	50	15,000.00	USD		
		90000003	B100	SV	09/09/2011	50	15,000.00	USD		
		90000004	B100	SV	09/09/2011	50	15,000.00	USD		
		90000005	B100	SV	09/09/2011	50	15,000.00	USD		
		90000006	B100	SV	09/09/2011	50	15,000.00	USD		
		90000007	B100	SV	09/09/2011	50	15,000.00	USD		
		90000008	B100	SV	09/09/2011	50	15,000.00	USD		
		90000009	B100	SV	09/09/2011	50	15,000.00	USD		
		90000010	B100	SV	09/09/2011	50	15,000.00	USD		
		90000011	B100	SV	09/09/2011	50	15,000.00	USD		
		90000012	B100	SV	09/09/2011	50	15,000.00	USD		
		90000014	B100	SV	09/09/2011	50	15,000.00	USD		
		90000015	B100	SV	09/09/2011	50	15,000.00	USD		
		90000016	B100	SV	09/09/2011	50	15,000.00	USD		
		90000017	B100	SV	09/09/2011	50	15,000.00	USD		
		90000018	B100	SV	09/09/2011	50	15,000.00	USD		
		90000019	B100	SV	09/09/2011	50	15,000.00	USD		
		90000020	B100	SV	09/09/2011	50	15,000.00	USD		
		90000021	B100	SV	09/09/2011	50	15,000.00	USD		
		90000022	B100	SV	09/09/2011	50	15,000.00	USD		
		90000023	B100	SV	09/09/2011	50	15,000.00	USD		
		90000024	B100	SV	09/09/2011	50	15,000.00	USD		
		90000025	B100	SV	09/09/2011	50	15,000.00	USD		
		90000026	B100	SV	09/09/2011	50	15,000.00	USD		
		90000027	B100	SV	09/09/2011	50	15,000.00	USD		
		90000028	B100	SV	09/09/2011	50	6,400.00	USD		
		90000029	B100	SV	09/09/2011	50	15,000.00	USD		
		90000030	B100	SV	09/09/2011	50	15,000.00	USD		
		90000031	B100	SV	09/09/2011	50	6,400.00	USD		
		90000032	B100	SV	09/09/2011	50	15,000.00	USD		
		90000033	B100	SV	09/09/2011	50	6,400.00	USD		
		90000034	B100	SV	09/09/2011	50	15,000.00	USD		
		90000035	B100	SV	09/09/2011	50	15,000.00	USD		
		90000036	B100	SV	09/09/2011	50	15,000.00	USD		
		90000036	B100	SV	09/09/2011	50	6,400.00	USD		

FBL3N is probably the best option as it shows enough dimensions to be extracted to spreadsheet, however when the data is used in Microsoft Power Pivot the dimensions does not seem to be the best possible dimensions available for data analysis. Names of the documents seem to be missing.

### Transaction FAGLL03

G/L account: 60000 Sales Revenue

Company Code: US00

Ledger: OL

Transaction FAGLL03 seems to be another option for this project, it shows enough dimensions however as happened in transaction FBL3N the names of the documents seem to be missing.